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Vol. IX. NEW YORK, FEB. 5, 1887. No. 6.

WE have a special cable dispatch from England announcing that the Edison-Swan Company has obtained a verdict against Woodhouse & Rawson on all points, the court standing two judges to one. In other words, the court of final resort sustains the judgment of the lower court, and this practically renders Edison's "filament" patent for incandescent lamps controlling in England. It would be premature to discuss the decision until it arrives here in greater detail, but it is evident that the bearing of the litigation in England on litigation here is important.

MANY of our readers are inventors, and hence will be interested in the paper on "Electrical Patents," read by Mr. A. C. Fowler, before the Electrical Section of the American Institute. Mr. Fowler has warrant in holding that the American patent system is probably the best in existence, giving the inventor a better return for his money than that of any other country. The remarks on the relation which patents in this country bear to similar ones taken out in foreign countries are of special importance to inventors, as to many this point is not clear, though of the utmost importance for the safety of their rights, both in this country and abroad.

AT the last meeting of the New York Subway Commission, the needs of the electric light companies came under consideration. It is evident that to meet the requirements of the case will take both time and money in liberal measure. Meanwhile the necessities of the telephone people are being attended to, though it cannot be said that the results so far have been perfectly satisfactory. We already hear complaints of leakages along the Sixth avenue line of conduits, and it is reported that the work of drawing in the telephone cables has been one of serious difficulty. In fact, dissatisfaction prevails in higher telephonic circles, but we must have patience. The work of getting New York's wires underground in good shape will take a great many years.

THE interesting communication by "W. M. S." in another column, criticising the theory advanced by a writer in a recent number as to the function of pole pieces in dynamos, shows in what manner experiments may, under certain circumstances, be interpreted in a wrong light. There is also pointed out in the present article the necessity of taking strict account of the relative magnetic conductivity of air and iron. This seems of late to be one of the principal methods of analysis of the design of dynamo-electric machines, and Mr. Gisbert Kapp and Dr. John Hopkinson have both published valuable treatises on this subject. Indeed, it has come to be recognized that the magnetic circuit must be treated in quite an analogous manner to the electric circuit, and that "magnetic resistance" must enter into the calculations of the dimensions of the iron masses of dynamos, just the same as the electric resistance is taken into account in the copper conductors. "W. M. S." also points out that light weight is not, under ordinary circumstances, to be particularly striven for in dynamo-electric machinery, for in such cases a large proportion of the material used would consist of copper instead of iron, which is far cheaper.

GENERAL SHERIDAN, in stating his preference for sunken batteries for sea-coast defense, lays great stress on the availability of electric motors for raising the guns and handling them generally. Electricity, as a source of power, does away with cumbersome hydraulic or pneumatic machinery and their pipe connections. He states truly, that any interruption in the former by the shooting away or disabling of the pipes would cause serious delays, while the stringing of a wire to repair a break is but a matter of a few moments. Although the General recognizes the storage battery as a medium for obtaining a supply of electricity, even when the dynamos are not working, he expresses a distrust regarding their present state of reliability for the purpose. The doubt was once pardonable, but in the present state of the art our military authorities need have no fear of utilizing for their purposes apparatus which has now shown itself to be reliable after several years of constant use. This matter of the reliability of the storage battery resolves itself merely into one factor for determination, and that is intelligent handling. Good work can be gotten out of an indifferent storage battery by intelligent management, but the best of them cannot stand neglect or abuse, any more than a dynamo or steam engine.

THE prospects for the meeting at Philadelphia on the 15th inst. of the National Electric Light Association are very bright. The attendance will be larger than on any previous occasion, and the matters to be brought up for discussion are unusually numerous and important. We are glad to note, from a circular issued by Mr. A. J. De Camp, Chairman of Executive Committee, that special attention will be paid to the question of the best methods of station construction and equipment. A whole day might well be set apart for a topic so vital in its bearings. To quote Mr. De Camp: "As many new stations will probably be built during the coming year, and those already built will be extended or remodeled, it is proposed to invite plans for exhibit at the meeting in February; this, in connection with the engines, boilers, dynamos, for arc and incandescent lighting, for motors, and their relation to each other, are subjects which will be discussed at the next meeting. In view of the many schemes which are brought to the attention of the investors, all of which require capital, the majority of which are visionary, but none of which can safely be ignored without investigation, it is manifestly to the interests of every one so engaged to be connected with an association so eminently qualified to discuss such matters, from both a practical and theoretical standpoint." This is a very sensible view and plea, and will, we trust, meet with a hearty response.

THE able and impressive memorial submitted to the Indiana Legislature by the Central Union Telephone Company must have considerable influence in turning public opinion in Indiana against the unjust law passed in 1885 to limit telephone rates. As the memorial says: "The experience for eighteen months of the practical workings of this law in all portions of the State, has demonstrated that the interests of the public, particularly that portion of the community who desire and need telephonic service, have not been promoted by this act." No man can read the statement, in detail, of the effects of the law, without feeling that more harm has in the aggregate been done to the business interests of the State at large than to the special interest it was sought to injure, although that, of course, is so hampered that telephonic operations cannot any longer be carried on with profit. The business is now worked at a loss, and must be while such legislation prevails. We trust that the Legislature will either repeal or greatly modify the unjust law of 1885.

As might be expected, the recent universal breakage by storm of the wires in England has directed attention there to underground systems, and the German methods have come in for special eulogy. We see little reason for bestowing wholesale praise on the German underground work. It is, after all, chiefly military in its uses, and affords slight ground for imitation in England, where the business is so overwhelmingly commercial and is necessarily studied from that standpoint by a highly active and competent set of officials and experts. The question in a commercial country is largely, though not exclusively, one of expense—what the business will stand. Such storms as that which visited England are extremely rare, and when they come they not only break wires, but blockade railways and roads, and render all aggressive movements of troops by an enemy impossible. England's telegraphs and telephones will be all right in the hour of emergency. Of course, steps should be taken to bury the wires wherever it can be prudently done, but what we object to is the wild demand for complete undergrounding, and the reference for examples to cases that are not parallel. It will be remembered that when Professor Plympton came back from Europe the other day, he declared that America could learn nothing from Germany or any other country, but must find its own solution of the underground question. Our hearty admiration of many German achievements in electrical application cannot induce us to second the indiscriminate glorification of Germany's few underground wires.

AN important point in the wire gauge agitation has been reached in the present adoption by the Edison Company of a gauge which necessity has forced upon it. It is needless to recall the history of the various gauges now in use and the attempts made to secure a universal standard. The new English gauge seemed to offer no special advantage over those already in use, and it was adopted here in some instances merely in a spirit of kindness and reciprocity, and to secure the much desired uniformity. In the Edison gauge, which is tabulated in full in another column, the objections which have been raised against the older gauges have been avoided in a great measure. It will be noted, in the first place, that a surface dimension or sectional area of the wire (circular mils) has been made the basis of calculation, in contradistinction to the older gauges, in which a linear dimension (diameter of wire) is the basis. The area of 1,000 circular mils may be said to be the unit of the system, as all numbers of the gauge designate a wire of a corresponding number of thousands in circular mils. Thus, as the numbers follow each other in arithmetical progression, the workmen can readily grasp the idea of the gauge, especially as the small numbers correspond to the small sized wires, and *vice versa*. What led more particularly to the adoption of this gauge was the fact that the difference in size between consecutive numbers of the old gauges was too great, so that it frequently became necessary to take a wire which was larger than that actually required to carry the maximum current, and hence entailing heavy additional and unnecessary expense. If we compare, for instance, the difference in sectional area between a No. 3 and No. 4 B. & S., we find it to be 10,892 circular mils, whereas in the new Edison gauge the consecutive sizes of wire of about the same areas have a difference of only 5,000 circular mils. As regards the willingness of wire manufacturers to furnish the wire drawn to the new gauge, it may be stated that all of our prominent and influential makers have signified their intention of furnishing wire according to it. This is quite a consideration. For all but the finest sizes of wires, which are not included in the table, the gauge seems to be an eminently practical one, and for electric lighting especially it presents numerous advantages. We hope that the members of the National Electric Light Association will give the new departure the attention which it merits, and we expect to hear some expression of opinion on this subject at the coming Convention at Philadelphia.

NEW BOOKS.

THE PUMP CATECHISM. By Robert Grimshaw, M. E. New York: Practical Publishing Co. 1887. 4¼ x 6 inches. 233 pp. Price, $1.00.

The author has taken it for granted that not every one intrusted with the care of pumps is qualified by experience to handle them with intelligence. Hence he has subjected the principal pumps on the market to a catechism which enters into all the details of their construction, repair and maintenance. For those engaged in the operation of this class of machinery, the little volume will be of considerable interest, and may save much vexation and trouble.

ANNUAIRE DU BUREAU DES LONGITUDES. Paris, 1887. Gauthiers-Villars. 18 mo, 892 pp. Price, 1 fr. .50.

Besides the usual large amount of practical information which it contains each year, the *Annual* for 1887 includes articles from some of the best known savants on coinage, statistics, geography, mineralogy, etc. In addition, there is a highly important section accompanied by curious photographs on astronomical photography at the Paris Observatory by Admiral Mouchez.

On Pole Pieces and Dynamo Construction.

BY W. M. S.

In looking over THE ELECTRICAL WORLD of the Jan. 15 issue I saw the article written by Mr. H. F. Watt, and was much surprised at some of the theories and rules given.

Mr. Watt seems to think it essential in dynamos that the magnets should be saturated, and seems also to think that, if this is not the case, no matter how much iron the magnets contain, the field must be a comparatively weak one. Now, it is a well-known fact that the curve giving the relation between magnetism of a piece of iron and the energy required to produce it is for a certain period approximately a straight line, then bends (the knee of the curve), and would soon go over into a straight horizontal

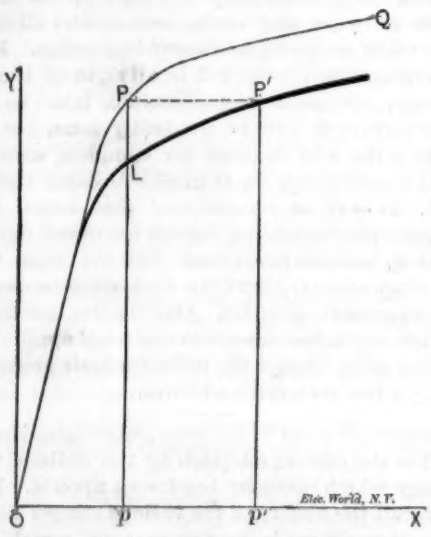


FIG. 1.—DYNAMO CONSTRUCTION.

line if it were not for the direct influence of the magnetizing coils, which cause a slight incline in this part of the curve. (See Prof. S. P. Thompson's book on "Dynamo-Electric Machinery.") In other words, the magnetization, or the magnetic field produced, increases at first in the same proportion as the magnetizing power; then, having attained a certain strength, depending on the quantity and quality of iron used, it increases at a much slower and constantly declining rate, until after a certain point is reached, no matter how much additional power is expended, there is no increase in magnetization.

The diagram, Fig. 1, shows the general outline of such a curve, *O P Q*. The bend or knee begins at *P*, and beyond that point any increase in magnetization can only be attained by the expenditure of a proportionally large amount of energy. It is therefore obvious that, in good dynamos, magnets of such bulk or cross section will be chosen that, when giving the desired work, the magnets will be magnetized up to, or near to, the point *P* at which the knee begins. Unless for special purposes, it would be uneconomical to use magnets brought to a less degree of energy, for though the energy required remains the same, an increase of iron and also of copper (due to the larger cross section) is required for the magnets; thus unnecessarily increasing the weight of the dynamo, but, what is more important, also its cost. On the other hand, it would be worse to use smaller magnets. In Fig. 1 *O L P'* gives the curve of magnetization for a magnet in every respect similar to that for which *O P Q* is the curve, but weighing less. If a dynamo having these smaller magnets is required to have the same magnetic field (not intensity of field, but total field) as one with the larger magnets, instead of the small power *O* required with the latter, the far greater power *Op'* is required. If only the same energy *Op* were applied, the magnetic field and the corresponding E. M.F. would be smaller than desired unless the speed of the armature is increased, as Fig. 1 shows. But the magnetizing power of a magnet is the product of the current and the number of turns the wire makes around the magnet. To increase this power, therefore, three things are possible, viz.: 1. To increase the current. 2. To increase the number of turns. 3. To increase both current and number of turns.

Of these three (1) and (3) are objectionable, as an increase of current means a constant expenditure of addititional work, and consequently a decrease of efficiency of the dynamo. The only thing to do, therefore, is to increase the number of turns, but at the same time keeping the resistance of the magnetizing coils the same. That is, not only is it necessary to increase the length of the wire required, but also its cross section. It is true that as the circumference of the smaller magnet is less, the length of

FIG. 2.

each individual turn is smaller than with large magnets; but the length of the turn decreases simply in the same ratio as the diameter, whereas the total length required, and consequently also the cross-section of the wire, increases in a far larger ratio. To decrease the weight of the dynamo, therefore, and thus save a few pounds of cheap material, a larger amount of material about six times as expensive as iron is required. If for every six pounds of iron saved only one additional pound of copper were required, then, not taking into account the increase in work, the small dynamo would be more advantageous; but unfortunately this is not the ratio above a certain point near *P*, and, is not the main desideratum of a machine *cheapness* and not *small weight?* Of course there may be special cases where small weight irrespective of cost is a necessity, as for example in motors for tram-car work, but aside from these, that machine which is the cheapest will be the most in demand, and not the one weighing the least, other things, such as efficiency, mechanical strength, workmanship, etc., being equal.

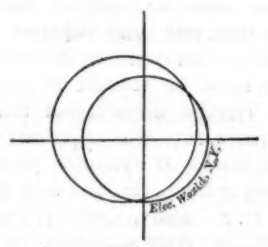


FIG. 3.

In speaking of the lines of force and their relation to E. M. F. of the dynamo, Mr. Watt makes a great mistake. I think there are more electrical engineers (at least such that deserve that title) than Mr. Watt seems to believe who know such an elementary law as that propounded.

With regard to the magnetic field, it is always considered a great advantage to have it as uniform as possible, though as regards the total result, *i. e.*, the total E. M. F. induced, it is immaterial (see Kapp's book on "Electrical Transmission of Energy," pages 78, 79), unless the distortion reaches too great an extent, as, for instance, in cases where Pacinotti teeth are employed. In tracing the curve giving the increase and decrease of difference of potential between two consecutive commutator strips all round the commutator, the curve will show gradual increases and decreases when the field in which the armature rotates is uniform, as shown in Fig. 2; but abrupt changes will be found when it is distorted, as in Fig. 3. With a distorted field, sparking at the brushes and large variations of lead with different loads are frequent. To produce well defined

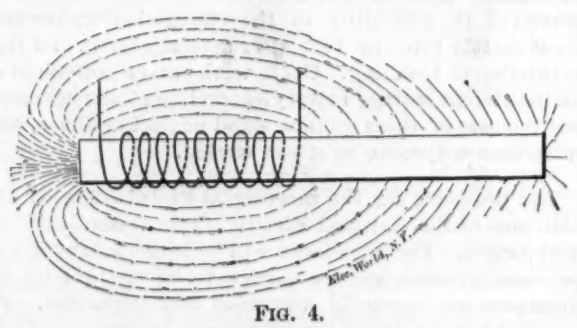


FIG. 4.

neutral points and a small lead, all that is necessary is to have a very strong magnetic field set up by the magnets, the lead depending on the ratio between the magnetic field set up by the magnets and that of the armature. The larger this ratio the smaller will be the lead.

The main objection Mr. Watt has to the present type of dynamos is in the use of pole pieces, and to support his reasoning he cites the well known experiment with a straight electro-magnet having the magnetizing coils wound only on one half. If Mr. Watt had tried the experiment with a horse-shoe magnet, having the general shape of those used in dynamo constructions, he would have had different results. The law given by Kirchhoff on the distribution of the current through paths of different resistances applies equally to magnetic circuits, unless these are near the point of saturation. But, as has been pointed out before, in well designed dynamos the field never comes near that limit, and, as far as dynamos makers are concerned, the law holds good, that the lines of force are distributed along the various paths open to them, and the number of lines passing through the unit section (taken at right angles to the lines) will be inversely proportional to the resistance of that path. Now the resistance offered to the passage of the lines of force by air is about 720 times larger than that offered by iron. (See Kapp's article in THE ELECTRICAL WORLD, Dec. 4, 1886.) In other words, if it requires a magnetizing power x to produce 720 lines of force in a circuit composed of iron, the same will only produce one line of force in an exactly similar circuit of air. Returning now to the straight magnet only half way wound with wire, on looking at Fig. 4 it is quite obvious, without further explanation, why the one pole is so much stronger than the other. But if Fig. 4 is compared with Fig. 5, which gives a magnetic circuit of the general type used in dynamos, and which is also only wound with wire on one side, it will be seen that if this winding should have any effect in causing a difference in strength between the two poles, this can only be a very slight one indeed, because the path the lines of force are desired to take, being composed nearly entirely of iron, has a far smaller resistance than any other path. A certain leakage undoubtedly will be found in every type of magnets, and it is a question whether the benefit derived from any appliance to prevent this leakage will warrant its cost.

It has been said that the path the lines of force are desired to take is *almost entirely* composed of iron. The only parts of the circuit not of this material are the spaces between the magnets and the armature, these being composed of material of much higher magnetic resistance than iron, *and herein is to be found the reason and also the necessity of using pole pieces.* As I have pointed out before, the electric and the magnetic circuits are very similar, both being governed by nearly identical laws. In both cases the law of the resistance of the circuit is the same, *i. e.*, $\frac{\text{length}}{\text{cross section}}$. It is evident, therefore, if a bad conductor be placed between two good ones, the only way to decrease the total resistance of the circuit is to make the bad conductor as short as possible, and to give it a large cross section. Now, the distance between armature and magnets

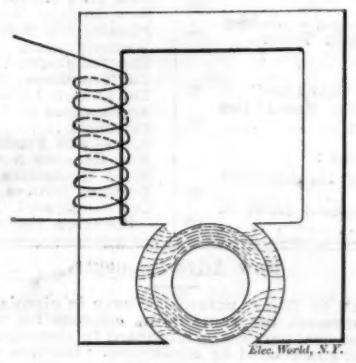


FIG. 5.

depends on the amount of copper required on the armature and the necessary clearance or air space. To reduce the resistance it only remains possible to increase the cross section of this space, and to do this pole pieces are necessary. They certainly have a detrimental effect in increasing the resistance of the iron part of the magnetic circuit, but, as their cross section generally is a large one, this slight increase is really infinitesimal as compared with the decrease in the resistance of the air space. But, on the other hand, pole pieces ought not to be made too large, or, in other words, extend over too large a part of the circumference of the armature, as this might cause excessive leakage, by bringing opposite poles too near each other.

The same reasoning as cited in connection with the pole pieces holds in considering the contact surfaces between wrought and cast iron. The cross section of the latter, where both these materials are used in a magnetic circuit, ought to be 1.7 times larger than the cross section of the wrought iron, or else the magnetizing power required to obtain a certain magnetic field would have to be larger, owing to the increased resistance of the circuit.

Professor Thompson pointed out, and subsequent experiments have confirmed it, that with drum-armatures, large pole pieces, each extending over about one-third of the circumference of the armature, should be used; but with armatures of the Gramme ring, and more especially the flat ring type, the pole pieces should be small, and a large number of them used. The reason for this is as follows: A flat ring, having the same cross-section of iron as a drum armature, has a much larger diameter than the latter, and as the pole pieces surround it on three sides, leaving only the smallest one free, they can be given the same interior surface as the pole pieces of the drum armature without taking up a great space, measured along the circumference of the flat ring. But, on the other hand, if only two poles are used, the length of the iron circuit in the ring is very large, and consequently its resistance also, and this is prevented by the use of more than two pole pieces; the latter being possibly due to the fact that they occupy but comparatively little space.

The Water Power of the Cowles Company at Lockport, N. Y.

Much has been written in these columns about the new process of smelting aluminum in electric furnaces, now practiced by the Cowles Electric Smelting and Aluminum Company, at Lockport, N. Y., and of the large Brush dynamos, which generate the current for the operations. These dynamos, of which several additional ones are now in course of construction, are capable of working up to 550 h. p. each, and as the original source of power in this case and its mode of application are quite novel in some respects, we propose to describe them.

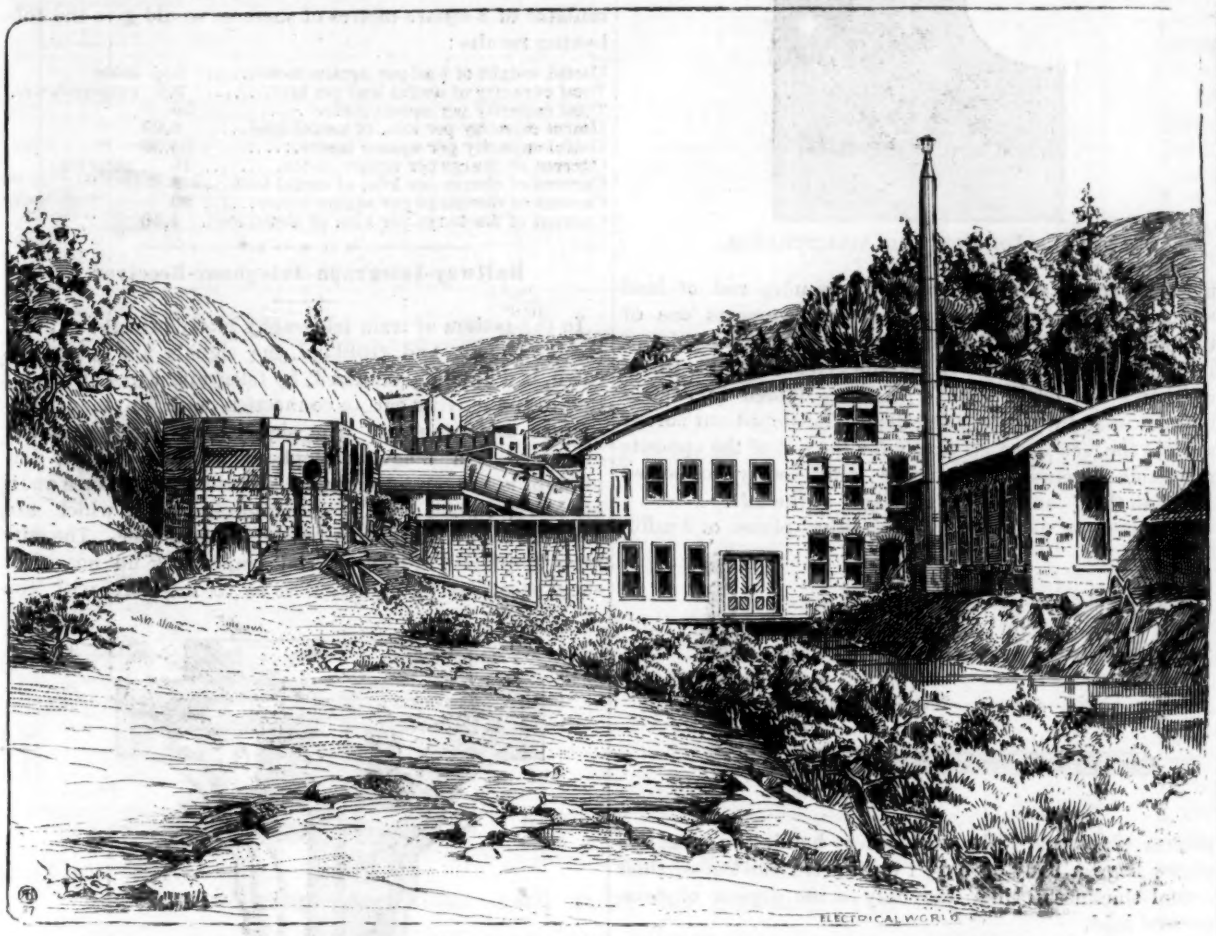


FIG. 1.—WATER POWER FOR ELECTRIC SMELTING PLANT, LOCKPORT, N. Y.

As is well known, Lockport is endowed with a magnificent water power. At that place, the lower level of the Erie Canal is fed from various sources, the principal one being the upper level of the canal above the locks, the water passing through the five pair of double locks and also through the hydraulic races and tunnels, which circumvent the locks. These latter have been constructed for water power, utilizing the 72 feet of fall in the canal at this point. The water thus fed to the lower level must be drawn off again at spillways into creeks or channels in order to prevent overflowing the banks of the lower level, and hence a large quantity is drawn off into the Eighteen Mile Creek about 2,000 feet east of the locks, at Lockport. The water has about 20 feet fall into this creek from the canal, and thence it falls over numerous dams on its way to Lake Ontario, a distance of 12 miles. The total fall of this creek from the canal to the lake is about 278 feet, and its banks rise to a height of 200 feet on each side.

It is upon this creek that the works of the Cowles company are situated. Our illustration (Fig. 1) gives a general view of the buildings. In the main building, the ground floor on the left side, shown in the illustration, is occupied by the water-wheels, while the first floor contains the dynamos and machine shops. The entire remaining half of the main building is occupied by the electric furnaces, which, for the sake of ventilation, are situated on the ground floor, and have nothing above them but the roof.

The annex shown at the rear is the foundry in which the rough metal as it comes from the furnaces is remelted and cast into ingots or patterns.

The works are located about 1¼ miles from the canal, their tail water being 198 feet below Lake Erie and 126 feet below the lower canal level.

The company purchased land on each side of the Eighteen Mile Creek, which embraced 35 feet fall of the water, and with this head they drive their turbines. The average quantity of water flowing in this creek is from 12,000 to 15,000 cubic feet per minute. In order to utilize this fall of 35 feet in the creek bed, a race was dug in the side hill 500 feet long, from the head of the fall to the building in which are located the turbines, dynamos and furnaces. From the lower end of this race the water is conducted down to the turbines by iron conduits 8 feet in diameter. This is clearly shown in the engraving Fig. 1. A fall of 28 feet is thus obtained to the centre of the wheels, the remainder of the 35 feet fall being utilized by draft tubes on the turbines. This arrangement leaves the turbine penstocks 7 feet above the tail water, where manholes give quick and easy access, when desired, to the wheels.

The 8-foot conduit from the race above leads directly into the turbine room shown in the engraving Fig. 2. The conduit terminates in the head of a horizontal cylinder or penstock of ⅜-inch boiler iron, 9 feet in diameter and 9 feet long. In each end of this horizontal cylinder is a "Victor" turbine built by Messrs. Stillwell & Bierce, of Dayton, O. These wheels are placed in a vertical position on a horizontal shaft which passes right through the centre of the iron penstock. Discharge holes on each end of the latter allow the water, after passing through the wheels, to escape into the draft tubes, which are given a quarter turn, discharging the water into the tail race below.

The 6 inch shaft, upon which these two 30-inch Victor wheels are keyed, continues from one end of the penstock horizontally into an adjoining room, the pulley room. Here is placed on the horizontal shaft an iron pulley 72 inches in diameter, 50 inch face, weighing 6,000 pounds. From this pulley and fly-wheel combined a 44 inch double leather Hoyt belt transmits the power to the Brush "Colossus" dynamo on the floor above, the dynamo floor.

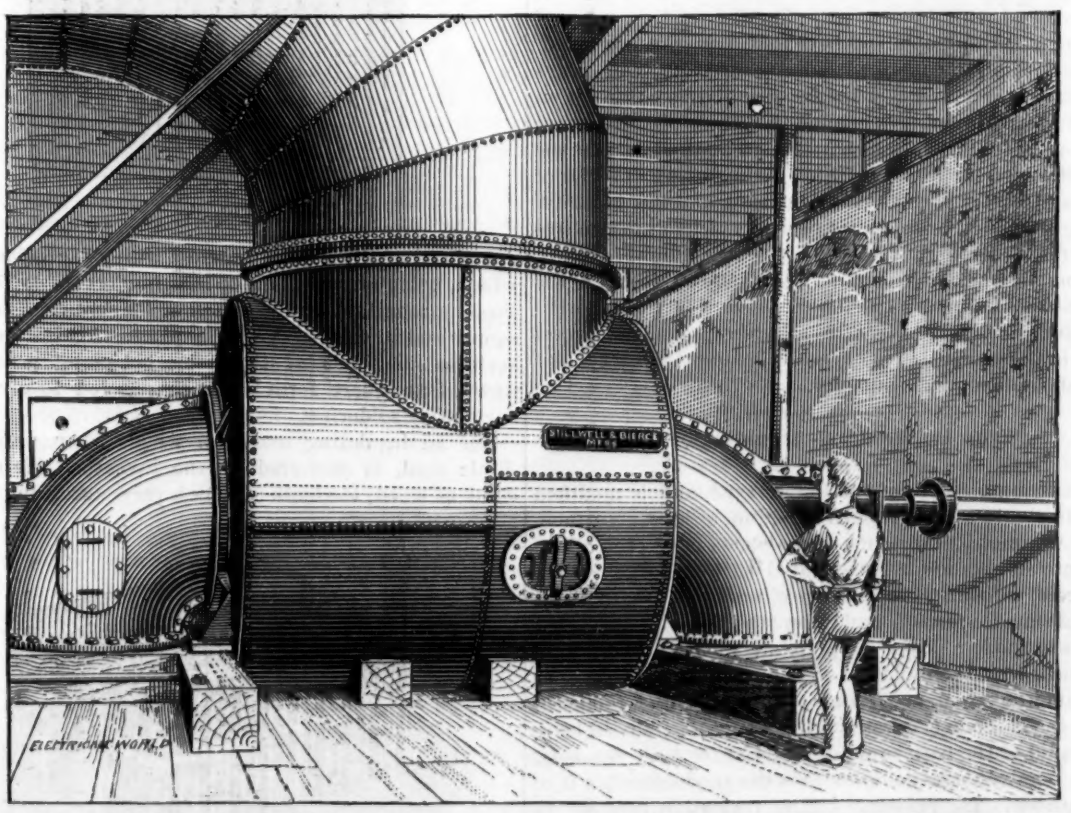


FIG. 2.—WATER POWER FOR ELECTRIC SMELTING PLANT, LOCKPORT, N. Y.

By this arrangement of turbines on a horizontal shaft, the disadvantages and annoyances of bevel gears transmitting heavy loads are avoided which would be met in the case by the ordinary method of setting turbines on a vertical shaft. The setting of turbines on a horizontal shaft is by no means a new idea, but it has only lately been put into practice to any great extent. The Victor wheels run at 240 revolutions per minute, developing 550 h. p.

As stated above, several additional Brush dynamos are in course of construction, which will be placed in position. It will be noticed that provision has been made for the additional power they will require in that the head race opposite the building is provided with two additional openings for the outlet of the water which will be required for turbines, soon to be placed in position.

Underground Work in New York.

At the last meeting of the New York Subway Commission a large amount of important business was brought up. One leading question was that of the needs of the electric light companies. Mr. Sherburne B. Eaton presented the case of the Edison Company. In the section bounded by Wall and Fulton streets, Broadway and the East River, there are now 13,000 Edison lamps. The wires had been underground for more that five years, but they now came to this commission for further privileges. They therefore asked for trenches to be built in the district bounded by Third and Eighth avenues, Eighteenth to Fifty-ninth street. They had purchased land for central stations on Twenty-sixth, Thirty-ninth and Fifty-second streets, and had in bank $1,250,000 to go ahead. They did not only furnish light, but power. If the Subway Commission had its conduits ready they would be prepared to go into them at once, provided the rental was reasonable.

The Harlem Electric Light Company claimed that the stretching of their wires away from poles and over the houses had been objected to by the insurance companies; and that the policies of many Harlem buildings would be vitiated if these wires were not removed from the top of buildings. They therefore asked the right to construct posts, ornamental as well as useful, from Eighty-sixth to 170th street, from Fourth to Eighth avenue. Referred to the engineer for report at next meeting.

Mr. Edward Lauterbach suggested that the cable tunnels might be utilized for that purpose, especially along 125th street.

Chief Engineer Kearney stated that the following applications for trenches have been made:

Edison Electric Company	88.08 miles trench.
Metropolitan Telephone Company	10.47 miles street.
Westinghouse Electric Company	48.25 miles street.
Baltimore & Ohio Company	3.27 miles street.
Western Union Telegraph Company	.86 mile street.
Total	151.25

He also said, "wires and poles are now being taken down on Third avenue by the Western Union Telegraph Company, for which the commission have allowed a cable upon the elevated structure to be substituted, and representatives of that company assure me that within a short time all the poles on that street, except those bearing the wires of the city departments, will be removed. I will call the attention of the Board to a letter received from the Metropolitan Telephone and Telegraph Company applying for underground accommodations to take the place of those overhead in a downtown district where the expected tearing down of a building in which the company has a switch-board necessitates the doing of something before the 1st of May. The route, which should be begun as soon as the weather is suitable, is from Broadway at Vesey street to the Brooklyn Bridge. The object of this route is to connect the offices of the telephone and telegraph companies in the lower part of the city with Brooklyn and Long Island and the east side of the town."

The matter was laid on the table for future action.

A complaint from the Department of Public Works that there is a leakage at the Sixth avenue manholes was referred to the engineer.

Referring to the request made by the telephone company to have subways constructed as soon as possible

from Cortlandt street down Broadway to the Exchange Building, in lower Broadway, Mr. Edward Lauterbach, for the Construction Company, asked that authorization be granted at once, as the price of material was advancing and they were anxious to go to work at once. It was so granted.

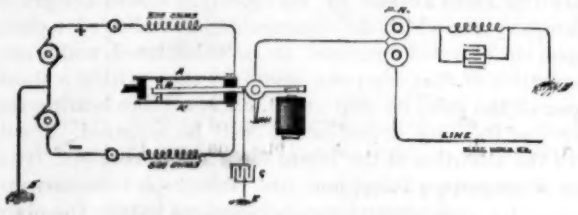
Attorney-General O'Brien has brought an action against the New York Underground Telegraph Company to restrain it from excavating the streets of New York for the purpose of operating electrical conductors under ground, and also to dissolve its charter. The summons was served on General Manager W. H. Johnstone, in New York, on Jan. 27, and the trial will be in the Albany Circuit, probably at the next term.

Dynamo Quadruplex Working.

BY C. L. HEALY.

For those interested in quadruplex telegraphy, allow me to relate some experiments made on the Chicago and Boston wires of the Commercial Telegram Co., operated from No. 18 Broadway, in this city. The pole-changer used on the quadruplex sets of the Western Union Telegraph Co. at No. 195 Broadway has a dead break of considerable length, which seems to be necessary on account of the excessive sparking on all forms of continuity preserving pole-changers. This dead break causes a bad result on the second or neutral relay, and all manner of devices have been put on to overcome a bad fundamental trouble which, from the results obtained by myself, seems to be unnecessary.

As shown in the diagram, I use an ordinary pole-changing transmitter, and adjust the same as where used with battery current. The springs *A A'* are connected to two dynamos of 200 volts E. M. F., each through 500 ohms resistance and a safety plug. This causes a pressure of 400 volts to pass at the moment of short-circuiting at the points *B* in going from one pole to the other. The line to the polar relay *P R*, etc., is connected in the usual way. Without the condenser *C*, the spark at the points is noticed, but is not injurious at all, being very light. With the condenser attached all spark is removedand the points are keep perfectly clean, and good reversals at a high speed, which is necessary on our quotation wires, are obtained. The Boston end



DYNAMO QUADRUPLEX WORKING.

is equipped in a like manner, and I believe it is the first wire worked with dynamo polar at either end.

There is nothing obtained here that was not expected. The only thing to consider is what causes all this extra sparking and seemingly utter impossibility to control it on the Western Union pole-changer? The only difference that can be found in the two systems is in the fact that the dynamos used by Western Union Company are in series of three and of very high internal resistance and low capacity, giving an inductive discharge, probably, when the two sets are thrown together, as would occur at the time of reversal. This may be the whole cause. The dynamos used by the Commercial Company at New York have but .0035 ohm resistance and a capacity of 200 ampères, against several ohms in those used by the Western Union Company and only about 15 ampères capacity.

The De Montaud Accumulator.

This accumulator is of the Planté type, and is modified so as to obtain a more rapid formation, a larger surface, and a symmetrical distance of the plates from each other.

If into an alkaline bath saturated with litharge (added in excess) we plunge two lead electrodes and pass in a current of suitable tension and intensity, there is deposited upon the anode a layer of peroxide of lead varying in thickness with the intensity of the current, and more or less rich in oxygen, according to the strength of the bath, while the cathode is covered with a layer of reduced lead. The liquid of the bath supplies material for both deposits, while in galvanoplastic operations the anode supplies it to the cathode. The principle of the formation consists in introducing in an efficient manner currents of great intensity, and thus shortening its duration.

Of two plates thus treated, the one becomes positive, and is covered with a thick layer of peroxide of lead. On leaving the bath, it undergoes various preparations and several washings, and is then fit to be mounted along with others to form an accumulator ready to be charged and to work.

The second, or negative plate, is covered with a thick sponge of lead. It is carefully washed, preserved in water with exclusion of air, and submitted to a very considerable pressure. After this operation it presents the appearance of ordinary sheet lead, but though the physical porosity has disappeared, the chemical porosity is intact, and this alone comes into play in accumulators. When a negative plate is constructed in this manner it is ready to be combined with the positives to form an accumulator.

The plates are of a rectangular form, Fig. 1; they are sloped out at one corner, and as two plates in juxtaposition are cut together, when they are separated the sloping out of the one serves for the handle of the other. This handle is doubled back on the plate which is suspended in the bath, so that the part which has to be soldered does not undergo any preparation. A hole pierced in this cor-

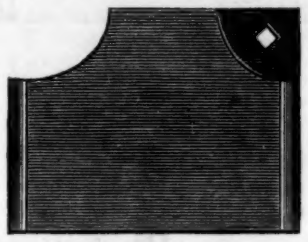


FIG. 1.—DE MONTAUD ACCUMULATOR.

ner of the plate serves to receive a square rod of lead which connects the plates together and supports one of the poles or contacts of the accumulator. At the point of soldering the doubled-down handle gives a double thickness, and the edges of the plate are folded in such a manner as to insure their solidity. The sloped-out corner affords the free space necessary for the rod of the opposite pole, and the same plate may be indifferently connected either to the + or the — at the right or the left.

The inventor uses in practice positive plates of 2 millimetres thickness. On the other hand, the negative plates have a body of only 1 millimetre thickness, their actual thickness being due only to the deposit of compressed lead.

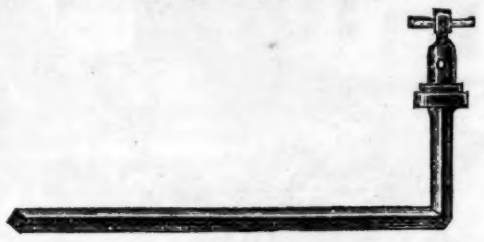


FIG. 2.

The rod which fixes the plates to each pole, Fig. 2, is formed of a special alloy of lead and antimony, not attacked by acid. This gives rigidity to the rod and hinders it from binding when the accumulator is taken out of its case. The copper piece which surmounts it is fitted at its base with an iron clamp which is fixed in the lead,

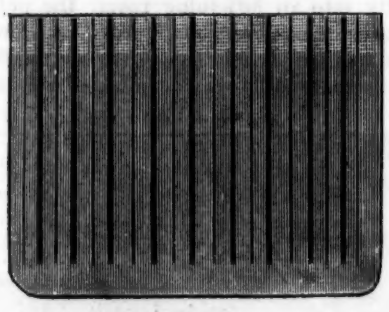


FIG. 3.

and above which is a wide furrow with two grooved parts, which, being immersed in the lead, hinders the copper from slipping round under the action of the screw. The rod is square and is cast in a single piece. Against one of its surfaces the ends of the connected plates press flatly upward; a square form has been selected to give more surface for soldering.

For an insulating material, wood, when plunged in dilute acid, is preferred by the inventor. He makes a comb of wood, the teeth of which vary according to the

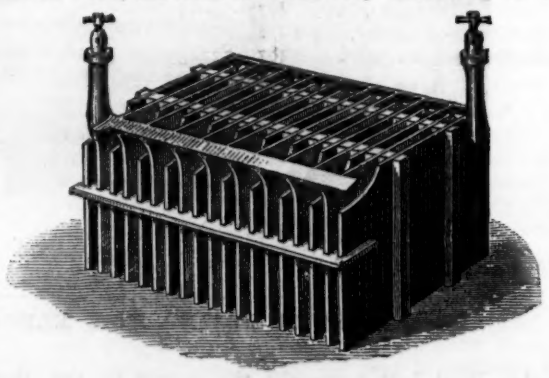


FIG. 4.

thickness of the plates to be lodged between them. Fig. 3 represents a comb having 1.5 millimetre slots for the negative plates and 2.5 millimetres for the positive plates. This appliance, which is 1 centimetre in thickness and 2 centimetres in width in the back, is made very cheaply by machinery.

The weight of the accumulator bears entirely upon the back of the combs, which are all placed back downwards, and the number of which varies according to the size of the plates. Small combs of wood clasp the plates at their extremities, and make the entire accumulator quite compact and manageable. The entire accumulator is inclosed in a wooden chest, which the outer teeth of the comb serve to insulate from the leaden chest, and to prevent any loss of electricity along the sides. Fig. 4 shows the arrangement of the side-combs and the plates complete.

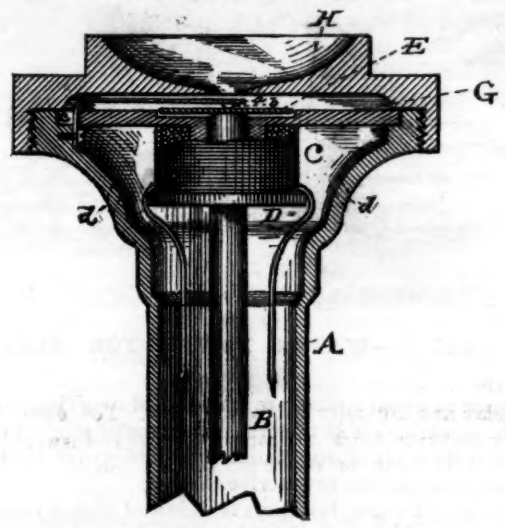
According to the inventor's experiments, the square metre of active surface can receive a charging current of 10 ampères, and furnish on discharging a current of the intensity of 20 ampères.

The total capacity of an accumulator having exactly 1¼ metre of surface is 87 ampère hours, which, with an accumulator of 2 square metres of surface, would give the following results:

Useful weight of lead per square metre.....	5⅓	kilos.
Total capacity of useful lead per kilo.....	9.1	ampère-hours.
Total capacity per square metre.....	50	" "
Useful capacity per kilo. of useful lead....	6.23	" "
Useful capacity per square metre.....	34.30	" "
Current of charge per square metre.....	10	ampères.
Current of charge per kilo. of useful lead....	2	"
Current of discharge per square metre.....	20	"
Current of discharge per kilo. of useful lead.	4.56	"

Railway Telegraph Telephone-Receiver.

In the system of train telegraphy lately brought out by Messrs. Edison and Gilliland, the signals are communicated, it will be remembered, by telegraph wires by induction to the moving car, in connection with an induction-surface upon the car. The signal-receiving instrument employed is a magneto-telephone receiver, whose diaphragm is thrown into musical vibrations to produce audible Morse signals by the induction impulses, which are controlled by a suitable vibrating transmitter. The currents employed in ordinary telegraph work do not affect such receivers by induction so as to interfere with the



RAILWAY TELEGRAPH TELEPHONE-RECEIVER.

railway signals; but it has been found that when the telegraph wires are conveying the very powerful currents used for quadruplex telegraphy such currents often communicate induction impulses which act with so much greater force on the telephone diaphragm that they produce vibrations sufficient to drown the musical signal vibrations, so that the latter cannot be distinguished.

In order to remedy this defect, Mr. E. T. Gilliland has recently invented a novel form of telephone, which is shown in section in the accompanying illustration. It consists of the usual case, permanent magnet, bobbin, and a diaphragm *E*, which may be a thin plate of metal or mica. This diaphragm is not secured at its edges, but is held directly upon the end of the magnet *B* by a spring *a*, which extends from the case, and has a downwardly-extending projection *b*, which rests upon the centre of the diaphragm over the centre of the magnet pole. Mr. Gilliland finds that when the centre of the diaphragm is thus held against the magnet the most powerful impulses do not affect the diaphragm so as to obscure the ordinary signaling impulses. The reason of this may be, he says, that as the diaphragm can have only a very slight or infinitesimal movement at any time, the strongest impulses cannot have any practically greater effect upon it than the weaker ones, and the musical tones of the railway signals can always be distinguished from the sound produced by the quadruplex telegraph or other powerful currents. Since only very small vibrations are necessary for the signals, these are not practically impaired by holding the diaphragm at its centre.

Since the diaphragm does not close the mouth of the receiver, a roaring sound will be produced when the instrument is held against the ear, as is the case with any hollow body closed at its outer and open at its inner end. To remedy this the receiver is closed by a plate *G*, through the centre of which the magnet passes. This plate is made in one piece with the spool *D*, the head of the spool being enlarged so as to fit the case. As shown, plate *G* rests upon a shoulder on the case, and the ear-piece *H* is screwed upon the end of the case and rests upon the plate to secure it.

Albany, N. Y.—The New York capitol at Albany is now magnificently lighted by the United States system. The plant is capable of running 3,600 incandescents and 100 arc lights, and at present 2,000 incandescents and 60 arcs are in use. A number of "Mogul" incandescents have been placed and they are greatly admired. Two engines are employed, one of 200 h. p. and one of 400.

The New Edison Standard Gauge.

The subject of wire gauges has for years been a source of much discussion and no little confusion. The necessity of care in specifying not only the number, but the standard, has given rise to perpetual embarrassment and, since the advent of the electric lighting industry, to frequent delay and difficulty in construction. For other branches of electrical work one gauge ordinarily answers the requirements, both of conductivity and mechanical strength, as well as another. But at a very early date the Edison Company, in their system of incandescent lighting from central stations, met the imperative necessity of careful calculation of the mass of copper in their conductors to secure (1) uniformity of pressure at the lamp throughout a widespread system, and this by means of (2) a well-defined maximum percentage of drop from a given nitial potential in the transmission of the necessarily large currents over considerable distances.

This much-agitated gauge question seems likely to receive a practical solution by the action of the Edison Company in departing from all the traditions of the past, and promulgating a new gauge suited to their requirements. In a circular issued to their agents, licensees and constructors, the objects and features of convenience of the new gauge are fully set forth.

The large experience gained by the company in their past work has shown that in the calculation of large conductors, the total number of sizes represented by all the gauges heretofore used in this country has been too limited, and the mass of copper represented by the largest of them is often insufficient to give the capacity desired. In consequence of this small number of regular sizes, it is very often impossible to avoid a waste of material and at the same time to secure sufficient conductivity because a wire of any existing gauge sufficiently large to convey a maximum current economically, may be considerably heavier per mile than one of a cross-section just adequate to give the proper per cent. of loss. In other words, in many cases one of the present sizes may give too great a loss, and the next larger (of any existing gauge) too small a percentage for true economy in operation. In this way thousands of dollars have probably been expended needlessly in copper in this country in the development of electric lighting, and imperfect distribution has often resulted.

The Edison Company have found, they state, that none of the manufacturers have adopted in their calculations on existing gauges the legal units used in the manufacture of their lamps. They have also found that in employing many men in construction work some standard whose units of measurement are in themselves significant is almost imperative.

Thus in almost every detail of their system of installing large numbers of plants of greatly varied capacity, and in calculations for central stations, not only in this country but throughout the world, the problem of arriving at a standard based upon the principles of distribution, and a graduation of sizes embodying something beyond an arbitrary and meaningless scale, and capable of meeting other requirements, forced itself upon the attention of their engineering department.

It is in order to avoid the difficulties heretofore experienced that a gauge has been worked out and adopted by the Edison Company which meets all requirements outlined by their experience. It is based upon the cross-section of the wire in circular mils, and the sizes indicate in convenient steps even thousands of this unit of measurement, from 3,000, the smallest found to be mechanically and electrically efficient in the equipment of buildings with Edison conductors, to 360,000, which represents a rod of copper six-tenths of an inch in diameter, such as may be used in the Edison underground system.

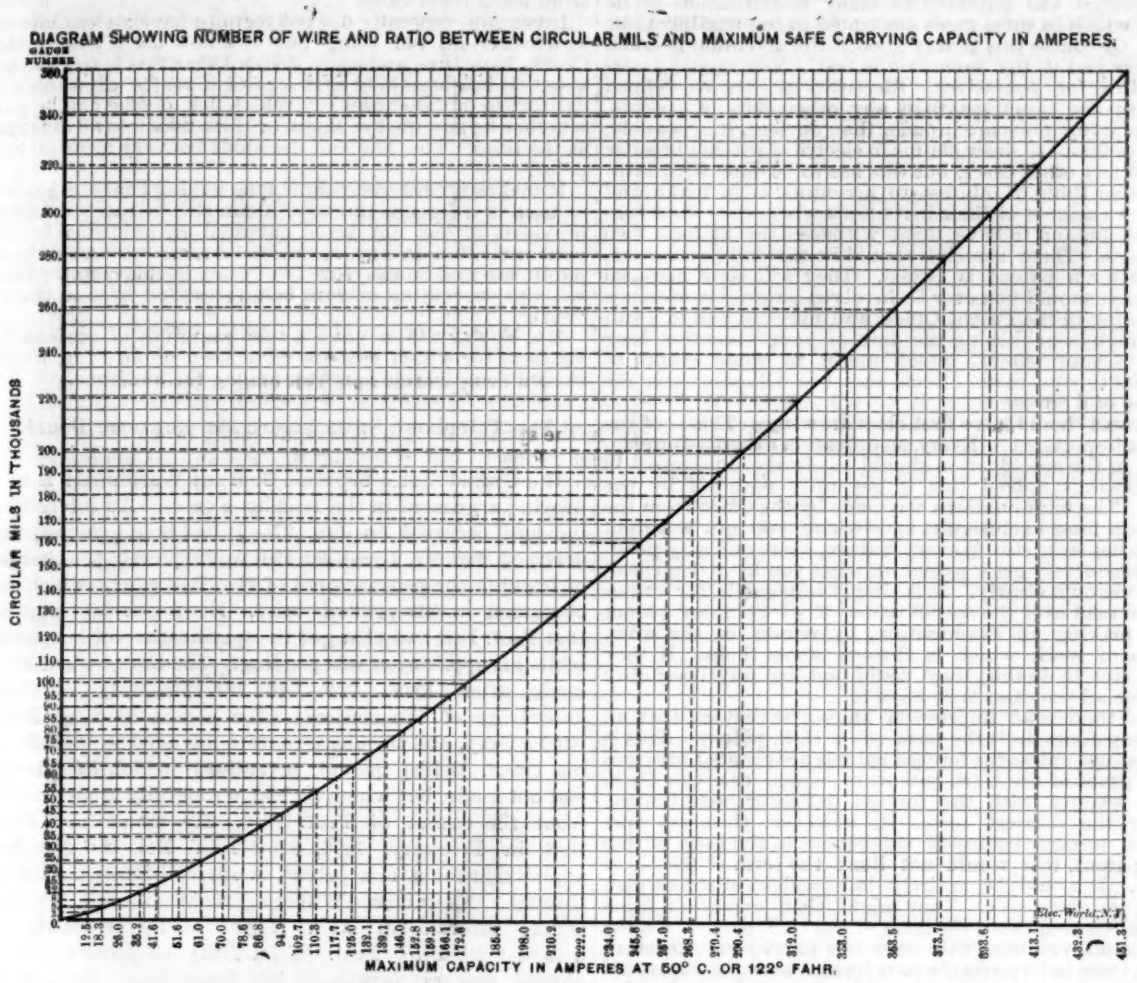


DIAGRAM SHOWING NUMBER OF WIRE AND RATIO BETWEEN CIRCULAR MILS AND MAXIMUM SAFE CARRYING CAPACITY IN AMPERES.
GAUGE NUMBER
CIRCULAR MILS IN THOUSANDS
MAXIMUM CAPACITY IN AMPERES AT 50° C. OR 122° FAHR.
Elec. World, N.Y.

EDISON STANDARD GAUGE AND CURRENT CAPACITY OF WIRE.

TABLE OF DIMENSIONS, WEIGHT AND RESISTANCE OF PURE COPPER WIRE.

E.S.G. Gauge Number.	Circular Mils. in Even Thous.	Maximum Amperes. $A = \sqrt[4]{\left(\frac{C.M.}{104}\right)^3}$	Diameter in Mils — .001 in = d	WEIGHT. Sp. Gr. 8.889 I. Lbs. per Foot.	WEIGHT. Sp. Gr. 8.889 II. Lbs. per Ohm.	LENGTH. III. Feet per Lb.	LENGTH. IV. Feet per Ohm.	RESISTANCE. Legal Ohms at 75° Fahr. V. Ohms per Lb.	RESISTANCE. Legal Ohms at 75° Fahr. VI. Ohms per Ft.	VII. Circular Mils. $= d^2$
3	3000.	12.5	54.78	.0090837181	2.597068	110.0870793	285.9038	.3850405	.003497600	3000.8484
5	5000.	18.3	70.72	.0151392409	7.213802	66.0535101	476.4970	.1386225	.002098640	5001.3184
8	8000.	26.0	89.45	.0242203427	18.463613	41.2876061	762.3184	.0541602	.001311780	8001.3025
12	12000.	35.2	109.55	.0363282400	41.537931	27.5267946	1143.4061	.0240743	.000874578	12001.2025
15	15000.	41.6	122.48	.0454098377	64.901697	22.0216596	1429.2431	.0154078	.000699663	15001.3504
20	20000.	51.6	141.43	.0605484008	115.371827	16.5157078	1905.7189	.0086664	.000524745	20002.4449
25	25000.	61.0	158.12	.0756821055	180.27794	13.2131630	2382.0418	.0055470	.000419807	25001.9344
30	30000.	70.0	173.21	.0908166584	259.72226	11.0111957	2859.8526	.0038522	.000349840	30001.7041
35	35000.	78.6	187.09	.1059548264	353.34049	9.4380769	3334.8547	.0028301	.000299863	35002.6681
40	40000.	86.8	200.00	.1210820000	461.44010	8.2588659	3810.9720	.0021671	.000262400	40000.0000
45	45000.	94.9	212.14	.1362274802	584.09787	7.3406628	4287.6655	.0017120	.000233227	45003.3796
50	50000.	102.7	223.61	.1513568350	721.02630	6.6069034	4763.7514	.0013868	.000209914	50001.4321
55	55000.	110.3	234.53	.1665008296	872.54729	6.0059761	5240.4982	.0011467	.000190821	55004.3209
60	60000.	117.7	244.95	.1816245211	1038.25764	5.5058645	5716.5059	.0009631 5	.000174931	60000.5025
65	65000.	125.0	254.96	.1967721793	1218.5857	5.0820192	6192.8868	.0008205 7	.000161465	65004.6016
70	70000.	132.1	264.58	.2119012989	1413.2644	4.7191782	6669.4464	.0007075 8	.000149937	70002.5764
75	75000.	139.1	273.87	.2270432099	1622.4571	4.4044479	7146.0276	.0006163 5	.000139938	75004.7769
80	80000.	146.0	282.85	.2421764790	1845.9518	4.1292176	7622.3367	.0005417 2	.000131193	80004.1225
85	85000.	152.8	291.55	.2573034954	2083.7594	3.8864608	8098.4491	.0004799 0	.000123480	85001.4025
90	90000.	159.5	300.00	.2724345000	2336.4054	3.6706071	8574.6870	.0004280 7	.000116622	90000.0000
95	95000.	166.1	308.23	.2875872249	2603.0461	3.4773124	9051.6047	.0003841 5	.000110477	95005.7329
100	100000.	172.6	316.23	.3027092769	2884.0822	3.3034996	9527.5645	.0003467 3	.000104960	100001.4129
110	110000.	185.4	331.67	.3329906016	3489.9577	3.0030877	10480.6483	.0002865 6	.000095410	110004.9889
120	120000.	198.0	346.42	.3632666336	4153.4329	2.7527989	11433.5654	.0002407 0	.000084460	120006.8164
130	130000.	210.2	360.56	.3935271358	4874.2259	2.5411208	12385.9938	.0002051 4	.000080730	130003.5136
140	140000.	222.2	374.17	.4237966529	5652.8989	2.3596222	13338.7058	.0001769 0	.000074970	140003.1889
150	150000.	234.0	387.30	.4540614049	6484.5728	2.2023452	14291.2678	.0001540 9	.000069997	150001.2900
160	160000.	245.6	400.00	.4843280000	7383.0425	2.0647164	15243.8880	.0001354 4	.000065600	160000.0000
170	170000.	257.0	412.32	.5146220577	8335.5249	1.9431736	16197.3720	.0001199 5	.000061735	170007.7824
180	180000.	268.3	424.27	.5448842348	9344.6859	1.8352522	17149.8535	.0001070 1	.000058309	180005.0329
190	190000.	279.4	435.89	.5751397788	10411.2406	1.7387097	18102.1258	.0000960 4	.000055242	190000.0921
200	200000.	290.4	447.22	.6054273401	11536.6814	1.6517233	19055.4057	.0000866 7	.000052478	200005.7284
220	220000.	312.0	469.05	.6659749213	13959.5666	1.5015580	20961.0990	.0000716 3	.000047707	220007.9025
240	240000.	333.0	489.90	.7264980844	16612.1144	1.3764661	22866.0134	.0000601 9	.000043733	240002.0100
260	260000.	353.5	509.91	.7870578463	19496.9968	1.2705546	24772.1000	.0000512 9	.000040368	260008.2081
280	280000.	373.7	529.16	.8476051956	22612.2329	1.1797944	26677.7858	.0000442 2	.000037484	280010.3056
300	300000.	393.6	547.73	.9081396792	25957.4640	1.1011502	28583.0667	.0000385 2	.000034986	300008.1529
320	320000.	413.1	565.69	.9686716683	29533.6961	1.0323418	30488.2691	.0000338 6	.000032799	320005.1761
340	340000.	432.3	583.10	1.0292139817	33340.1808	.9716143	32393.7964	.0000299 9	.000030870	340005.6100
360	360000.	451.3	600.00	1.0897380000	37376.6518	.9176517	34298.7480	.0000267 5	.000029155	360000.0000

1 MIL FOOT = 9.718 B. A. UNITS AT 0° C. [DR. MATTHIESSEN.]

EDISON STANDARD GAUGE.

The accompanying table gives the full number of sizes adopted, together with the other useful data required in calculation. Under the column headed "Diameter in mils" are given the numbers whose squares appears in the column headed "Actual Circular Mils," which correspond most nearly to the even thousands given in the second column.

By this system of graduation, the relative conductivity of wires is accurately expressed by their numbers, two strands of No. 20 being required to equal a No. 40, and a No. 200 being capable of conveying with a given percentage of loss in a given distance twice the volume of current of No. 100.

This direct reversal of the former empirical numeration of sizes, by which the highest gauge number has represented the smallest wire, would seem to commend the new gauge to all who use conductors for incandescent lighting, if it could show no other feature of progress.

The figures of the table thus formulated are based upon the universally accepted standard of resistance reached by Dr. Matthiessen's experiments, viz.: 9.718 B. A. units per mil foot of pure copper wire at 0. degree centigrade.

The Edison Company both here and in Europe have for some time used the legal standards of E. M. F. and resistance, and the apparatus at the factories of the Edison Lamp Companies throughout the world, by which all other devices are calibrated, was secured from the Electrical Standardizing Committee of the British Association at the Cavendish Laboratory. Hence this gauge is based upon the reduction of the 9.718 B. A. units to 10.496 legal ohms per mil foot at 75 degrees Fahrenheit.

It is not possible to secure commercially uniform standards of purity in copper conductors. An impurity of 2 or 3 per cent. does not make itself known in weight, length or other apparent details. A correspondence with all the leading wire manufacturers of the country has shown the Edison Company that a wire of 97 per cent. comes within the guarantee of all these firms, and in the actual calculation of conductors a resistance of 10.82 legal ohms per mil foot can be adopted as a safe average.

The weights of copper in the Edison gauge tabulation are based upon 555 pounds to the cubic foot, which corresponds closely to the standard specific gravity, 8.889. On this basis the weight of a mil foot is 0.00000302705 pound.

We may sum up then the advantages which this gauge offers to electric light engineers in five points:

1. The sectional area as the basis of graduation.

2. An increase in the number of sizes by which close approximation may be made to any cross-section required to secure a specific fall in potential.

3. A graduated system of numbers expressing definite relative values.

4. A new feature for numbering the wire, as No. 3, No. 5, No. 8, No. 12, etc., each number meaning so many thousand circular mils sectional area, thus making the number and area of the wire easily remembered by the ordinary workman.

5. The use of the legal ohm, thus basing American calculations upon European standards now universally adopted.

The curve and constant accompanying the gauge, show

ing the safe carrying capacity of the various sizes, were deducted from actual experiment in the Edison laboratory nearly two years ago, and upon them many subsequent tables have been based.

These tables and statistics will be used in the future work of the Edison Company, and all determinations and recommendations from their engineering department will be given the prefix "E. S. G.," indicating with the number which follows the thousands of circular mils required, as, for example, "E. S. G. 200," signifying 200,000 circular mils, Edison gauge.

Electrical Patents.*

BY A. C. FOWLER.

Our patent system is distinctively American, that is to say, it is not analogous to, nor derived from, the patent system of any other countty. As Americans, we are inclined to think it is better than any other patent system, and so it is, There is no system that can compare with it for liberality, no system which treats the inventor so well and where the fees for obtaining patents are so small as here. It is because of this liberal and good patent system of ours that we lead the world in the mechanical and electrical arts. It is not that we are naturally any more ingenious; it is because we have a great stimulus given to our ingenuity.

The distinctive difference of our system over other systems is that we hold examinations upon the merits. In foreign countries this is not done, except in Germany, where a few years ago a system like ours was inaugurated. In all of the other places a patent is granted as a matter of course, the merits of a case not being touched. The only thing is to see whether the papers are in proper form. In these foreign countries an inventor does not get as much as he does here. In the first place, the term of his patent is not generally as long as his United States patent. In the second place, his patent is practically of no value whatever until it has been sustained by a court. They only grant him the right to bring a suit. In our country the invention is given an examination upon its merits; that is, an investigation as to its novelty and operativeness. The inventor is granted the *prima facie* right to the thing. If any one infringes, the burden of proof is upon him to establish the invalidity of the patent, which remains good until it is overthrown. So that here he is really granted more than in other countries, excepting in Germany, as above noted, and for less money, for a greater length of time, and without having to pay taxes on the patent every year as in other countries.

Then, too, the invention does not have to be worked; that is, put on the market within a certain time, in default of which the patent lapses. So, too, our government is not so strict in many other matters. In some foreign countries, prior use and knowledge in another country renders a patent void, and the previous publication of one's invention in another country has the same effect, while in this country no such restrictions exist.

All inventions are not patentable. Under our laws there can be but four patentable subject matters, viz., an art (which means process or method); a machine; a manufacture or a composition of matter (that is, chemical products); or any improvement in these. If one is in doubt at any time as to whether a thing is patentable, provided, of course, it is new, ask yourself whether it is an art, a machine, a manufacture or a composition of matter, or an improvement thereof. If it be none of these, then it is not a patentable invention.

Upon questions of patentability there is often a diversity of opinion concerning the same invention. No rule has been, or can be, laid down as to what is patentable, except that the thing in question must, of course, come within the requirement of the statute, must involve invention and must be new and useful (that is, not harmful to the public welfare). The latter two questions are questions of fact, which can be definitely settled.

What invention is has never been definitely decided, nor indeed could it be. If a thing has been attempted and long sought for by others who have failed, it most likely, when successfully achieved, involved invention to produce it. And if also it is in great public demand after being discovered, this will go a long way in establishing that it is patentable. So, too, if it effects a great economy, this will tend to prove that it involved the inventive faculty to produce it. Of course, mere equivalents in an art are not patentable, as the substitution of the one for the other would naturally suggest itself to any one skilled in the art.

I find that inventors generally confound patentablity and infringement. They think that when they get a patent it means they can use the thing patented without liability to others. This is not always so. Their invention may be an improvement on some other invention, and their patent tributary to some other patent. The Patent Office, of course, is not to blame for this. It decides upon questions of patentability only, which involves novelty and invention only. That is, the office decides whether your invention has any new features over and above some other inventions, and whether these new features are patentable. It passes upon differences only. It does not decide whether you have to use another person's invention or a part of it in carrying out your own; that is to say, whether your patent is tributary to his,—whether his is the foundation patent. The courts only decide this question. They also pass upon all other questions affecting a patent. A man who improves on another's patented machine, and gets his improved machine patented also, cannot use the improved machine until he obtains a license from the former patentee. He is entitled to use his improvements, but he can use none of the prior patented machine until he gets a license from the owner of the prior patent. Were the second man to use the improved machine without such license, he would infringe. Now it is clear that his improvements are patentable, but he nevertheless infringes and is liable for damages to the first inventor.

Some inventors make it a practice after they have made an invention that is radically new, a departure from anything else, one upon which a broad generic patent could be founded, to subsequently invent all sorts of modifications and have them patented so as to cut off all lines of approach to their inventions, thus preventing any one from getting a modification of their apparatus patented. In this way they control the genus and the species themselves, and no patented modification is on the market to harass and worry them, even if it be *tributary* to their foundation patent, so they have no suits to bring. They have the whole thing in their own hands. I was talking to one of the leading and most successful inventors in this country some weeks ago, and he said this was the course pursued by him; that he invented and patented as many modifications as he could, which in some cases amounted to ten modifications in all. Of course this is very good if the invention is good, and very bad if the invention is bad. You should determine this for yourselves. Electrical patents are defined more by the functions than any other class of patents, and since functions are broader than devices, it is possible, in my opinion, to draw claims in electrical patents broader than in any other cases, but this has to be done with skill.

Another thing of interest to inventors is to make and preserve sketches of their inventions when they first conceive them, and to have them witnessed by at least two witnesses. These sketches should be carefully preserved, even after a patent is issued. They will be of material aid to you should you ever be involved in an interference proceeding in the Patent Office, and may aid you in a suit in court, by establishing the date of your invention long prior to your patent, which might in some events be essential to your case. Such sketches will also serve the purpose of a caveat.

All cases should have first class drawings. This is of the highest importance. Every modification described or suggested in the specification should be clearly illustrated in the drawings; indeed this is generally required by the office. The examinations are made by the office from the drawings most exclusively, and where you get a patent and do not *show clearly* every feature, some one may possibly subsequently get a patent on what you have described, but not shown clearly. It is simply impossible for examiners to read over the specification of every prior patent when making an examination, by reason of the great volume of work which is thrown upon them. If they would stop to do this, they could not by any possibility examine all the cases they have to.

I find there is an impression among inventors that all foreign patents limit the term of a U. S. patent. This is not the case unless the foreign patents are granted previous to the grant of the U. S. patent, in which case the U. S. patent expires with the foreign patent or with the one having the shortest term. If, however, the cases were filed in foreign countries subsequent to the issue of the U. S. patent, this would not limit the term of the U. S. patent. It would be entirely independent of the foreign patents in every way. They might then expire or lapse without cutting down the term of the U. S. patent. On the other hand, you must take care not to let your American patent issue before you file your foreign cases, as this would preclude you from getting a *valid* patent in most foreign countries. The way this is managed is to notify your foreign correspondents to file your foreign cases upon the day your American patent is to issue. This you do by first getting your U. S. application allowed and then drawing up your foreign cases commensurate therewith and paying the final government fee on a certain time so as to have it issued the day you have instructed your foreign correspondents to file the foreign cases. In this way the foreign patents do not limit the U. S. patent, nor the U. S. patent affect the foreign ones. There is another advantage in getting your application allowed here before applying for foreign patents, and that is you have the advantage of the examination upon the merits made by our Patent Office, and know what to claim as new in your foreign cases, making the claim cover the same features that your claims here are to embrace. Otherwise you have no guide as to what to claim, as these countries make no examination upon the merits of a case, and you run the risk of claiming too much, thus tending to invalidate your patent, or claiming too little and not getting sufficient protection. I am well aware that foreign agents send circulars to American patentees, telling them they can get patents for them in foreign countries after their patents have been issued here. I warn you not to be misled by any such statements. Patents, as I have before stated, are granted in these foreign countries as a matter of course, but the law of these countries prescribes that the invention to be patentable shall not be previously patented or published in any country, or within the realm. So you see, although you *can* get a patent in these countries for your inventions, which are previously patented here, you cannot get a *valid* patent—one that will bear a court's investigation, and until a foreign patent does this it does not amount to anything. The limiting of American patents by reason of previous patenting abroad is an awkward thing. It causes inventors and attorneys much annoyance. It is the occasion of much uncertainty and doubt. There is, moreover, no reason why such a law should exist. There is no justice or reason in this part of our law, and Congress has been asked time and again to repeal it. Much argument has been expended to show that it should be repealed, but it is still upon our statute books.

All U. S. patents upon their face are granted for seventeen years, even where foreign patents previously granted are mentioned in them. The Patent Office never limits the term of a patent. They are limited only by operation of law, and not expressly so in the wording of the grant.

There have been already over 350,000 patents for inventions granted in this country, and the number of applications is steadily increasing every year. Nearly 40,000 applications are now filed in a year in this country, exceeding by far that of any other nation, indeed any other two or three countries. Of this number about 25,000 are granted every year, averaging over 400 patents per week. About one-tenth of all these applications and patents are electrical, making over 3,000 electrical applications filed every year, averaging almost 300 electrical applications per month, or 10 per day. Upwards of 10,000 electrical patents have been granted to date. The activity in this line, as is well known, did not begin until a few years ago. To examine all these cases, together with their various amendments and arguments submitted, requires a large force of examiners. There are over one hundred and fifty examiners so employed in the Patent Office. This is exclusive of clerks, copyists, etc. There are thirty divisions in the Patent Office, including the Interference Division; each of these is presided over by a principal examiner who has usually four assistants. Applications are received by the application clerk, who assigns them to their proper class. They are then taken up in their regular order for examination.

The Electrical Division has recently been divided, owing to its increased size. The two divisions now employ ten examiners and four clerks. One of the divisions embraces telegraphs, telephones, lights and signaling devices; the other comprises dynamos, motors, batteries of all kinds and electric railways. These divisions, as well as the other divisions, are about three months behind in their work. Under such circumstances, inventors are often deterred from filing these cases.

Inventors generally do not seem to have a clear idea as to whether an old thing put to a new use is patentable. Courts have time and again decided that this is not patentable. It has been held that a prior inventor of a thing is entitled to all the uses to which his device can be put, whether he specified or knew of these uses and advantages at the time. The law and decisions are very clear on this point.

It makes no difference how long a thing has been known or used in a foreign country, it can still be patented here, provided it has not been patented or published before your invention in any country. And anything can be in public use and on sale for two years in this country even without preventing it from being patented here to the inventor.

MR. FOWLER then gave a few examples of curious inventions for which patents have been applied for, which caused considerable laughter among the audience.

* Abstract of a paper read before the Electrical Section of the American Institute, Jan. 26, 1887.

The Telephone Suits before the Supreme Court.

The United States Supreme Court at Washington is now hearing argument in the telephone cases. An interesting incident occurred on Jan. 27. It had been generally understood that Mr. Lysander Hill would present the charges of fraud in the procurement of the Bell patent which are contained in his printed brief. He began by asserting that Prof. Bell had changed the specifications of his patent while his application was pending. The changes had been made after Prof. Bell had surreptitiously obtained knowledge of the contents of a caveat filed by Prof. Elisha Gray, and the changes were intended to include in his (Prof. Bell's) patent, inventions which he himself had not made, but which he had wrongfully appropriated from the caveat of Prof. Gray. He maintained, first, that in February, 1876, after Prof. Bell had filed his application for a new patent, he surreptitiously obtained, through Examiner Wilber's room in the Patent Office, information with regard to the contents of a caveat filed by Prof. Elisha Gray to protect a telephonic process invented by him; that Prof. Bell availed himself of the knowledge thus obtained to amend and widen his own specifications so as to include many of the features of Prof. Gray's invention. Second, that between Feb. 14 and Feb. 19, 1876, Pollok and Bailey, Bell's patent attorneys, "in consequence of the guilty knowledge which they had of the contents of Gray's caveat, bodily interpolated an important invention and a claim therefor into Bell's specifications." As proof of such fraudulent interpolation, Mr. Hill referred to two documents, one a copy of Prof. Bell's specifications, which was given in January, 1876, to George Brown to be taken to England for the purpose of obtaining a patent there, and the other a certified copy of the interlined and interpolated specifications which had at one time been on file in the Patent Office, but which, he said, Prof. Bell or his attorneys, by collusion with the employés of the Patent Office, had subsequently removed and destroyed to concea the fraudulent interpolations, substituting therefor a clean copy in which the interlineations had been incorporated. He maintained that the George Brown copy of the specifications was the original form in which they were filed; that the certified copy of the specifications obtained from the Patent Office in 1879, and used as an exhibit in the Dowd cases—showing, as it did, 39 alterations and interlineations—was the next step in the fraud, and that such fraud had been consummated by the abstraction of this interpolated and interlined copy from the files of the Patent Office, and that substitution for it of a clean copy some time between 1879, when the transcript used in the Dowd case was made, and 1885, when it was discovered that this transcript had disappeared, and a clean copy purporting to be the original had been put in its place.

Mr. Storrow rose to reply for the American Bell Telephone Company and in defense of Prof. Bell, who had thus been accused of theft, bribery, perjury and the falsification and destruction of official documents. Mr. Storrow devoted himself first to an attempt to show that such changes as had been made in Prof. Bell's specifications after the George Brown copy had been sent to England were changes which he had a perfect legal right to make; that they were made in due time, and that they had no relation whatever to the Gray caveat, but were the results of Prof. Bell's independent thinking. He then took up the subject of the interlined and interpolated copy of Bell's specifications, which Mr. Hill alleged had been obtained in its present shape from the Patent Office in 1879. "When," said Mr. Storrow, "I was preparing for the argument in the Dowd case, which was pending in the United States Court for the District of Massachusetts, it became necessary for me to compare the specifications contained in Prof. Bell's application for a patent with the specifications sent to England by George Brown for the purpose of obtaining a patent in that country. I sent to the Patent Office and obtained a certified copy of the Bell specifications in the form in which they then were and always have been on file there. I began comparing this certified copy with the George Brown specifications, and for my own convenience I noted down and interlined in pencil on the certified copy the variations from it which I found in the George Brown specifications which were earlier in point

of time. After it became necessary to put a certified copy of the original Bell specifications in evidence as an exhibit in the Dowd case, and I put in this pencil-marked, annotated, and interlined copy without thinking to erase the pencils marks. The compositor set it up and it was printed exactly in the shape in which it stood, pencil marks and all, the penciled variations taken from the George Brown copy being put in brackets or otherwise disposed of according to the printer's discretion. The document thus stands in the record of the Dowd case which has been incorporated in the record of one of the other cases. I, therefore, made myself, and for my own convenience, the changes, interlineations and interpolations in this document, which have been used by counsel on the other side to support the charge of fraud. The original specifications now on file in the Patent Office are the same which have always been there, and as your Honors will see from a certified photographic copy which I now submit there are no changes or interlineations in them." Mr. Storrow then said that the Clerk of the United States Circuit Court for the District of Massachusetts was present with the original document in question, and that he should ask that officer to present it to this court as proof of his statements, and to show that interlineations were in pencil and in his (Mr. Storrow's) handwriting. Mr. Storrow was interrupted at this point by the Chief Justice, who said that he thought all this was inadmissible; that it was bringing into this court something which did not appear in the records, and that this court could not examine witnesses nor hear evidence. Mr. Storrow said he held in his hand a stipulation, entered into by counsel for both sides, that if this court so desired it might call for and examine all of the original documents in the court below, or the original Bell specifications, to verify the accuracy of alleged copies. The stipulation and accompanying letter were handed to the Chief Justice, who read them aloud.

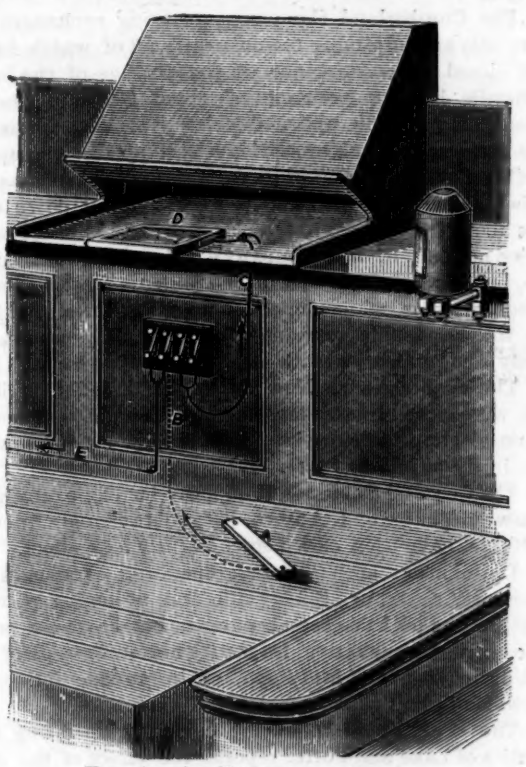


FIG. 1.—AN ELECTRICAL BATON.

The justices, after a few moments' consultation, decided that the stipulation was sufficient to authorize the court to call for the document, and the Chief Justice directed the Mr. Steteon, the clerk of the Massachusetts Circuit Court, to present it. He did so.

The New Postal Telegraph Bill.

The United States senate committee on post-offices and post roads, authorized Senator Wilson of Iowa, on Jan. 26, to report an original postal telegraph bill, as a substitute for that introduced by Senator Edmunds. The new bill is made up of the first 11 sections of that framed by the same committee in the last congress and reported by Senator Hill of Colorado. These sections provide for the establishment by the Postmaster-General of a postal telegraph system by contracting for the performance of the service with existing telegraph companies. The government is required to furnish the offices and make provision for selling stamps to cover the charges. The schedule of rates is fixed at 20 cents for 20 words, where the distance of transmission is 1000 miles, and 5 cents for every additional 250 miles, provided, however, that no charge for 20 words or less shall be more than 50 cents. Night rates are fixed at 15 cents for 2000 miles or under. All words except the date are to be counted and for every five words or less in excess of 20 an addition of one fifth the 20-word rate is to be charged. The press rates are fixed at not exceeding 35 cents for each 100 words sent at night and 75 cents during the day and at the same pro rata rate for each word in excess of 100. "Drop copies" are not to exceed 25 cents per 100 words at night and 50 cents during the day.

The Postmaster-General is required to retain 3 cents from the charges upon each message and pay over the remainder to the company as full compensation for its services. The company may maintain its own offices outside of the post-offices for the transmission of telegrams upon its own rates. The Postmaster-General is required to advertise for sealed proposals for the performance of the service, and to contract with the company whose proposal is deemed most favorable. Bonds are required for the faithful performance of the duties, and the contract is to contain provisions which will prevent discrimination in the order of transmission unfavorable to the postal telegrams. The contract is to extend over five years, and if the company shall have fully and fairly performed its duties it may be extended for another five years, upon condition that a uniform rate at or below the lowest rates specified in this act and without regard to distance shall be adopted, in which case the government will deduct only 2 cents for each telegram, instead of 3 cents. The company entering into this contract is required at once to open for use, as provided in the act, such lines as it may have at the time, and is allowed four years within which to put in operation such additional lines as may be required.

FIG. 4.—AN ELECTRICAL BATON.

The Postmaster-General is directed to advertise for sealed proposals to sell existing lines and franchises to the government, and if any one of the proposals received are deemed fair and reasonable, he is required to report the same to Congress.

An Electric Baton.

Frequenters of the French opera in Paris must have often been struck by the regularity with which the chorus and orchestra at the wings follow the time beaten by the leader of the orchestra. It is seldom that the arm of the conductor is before or behind the concealed voices or instruments. This result has hitherto been obtained by the leaders of the choruses keeping their eyes on the conductor, but it was often difficult to do this, particularly when the stage was entirely filled with the scenery. The musician who beats the time in the wings was then obliged to steal a glance at the front of the stage through a crack or hole and manage as best he might.

Recently this method has been superseded by an electric metronome invented by M. Carpentier. Note has already been been briefly made of it in our columns. This metronome is fixed on the desk of the leader of the orchestra in the wings, and is connected with the desk of the conductor by two wires. We give three illustrations of the apparatus. Fig. 1 represents the desk of the conductor, and shows the key operated by his foot, together with a repeating metronome which lies before him. Fig. 2 shows the instrument hung in the wings, while Fig. 3 gives a back view of the same, and exposes the mechanism. The action of the instrument, as far as regards the musician, depends upon a curious optical illusion. They see on the face of a blackboard, Fig. 2, two lines radiating from a centre; one line is white, while the other is black, and scarcely visible. Each of these lines marks the position of a square rod let in a slot cut into the board which forms the face of the instrument. The rods can be rotated a quarter of a revolution on their axes, and show alternately two sides or faces, of which one is white and the other black. The two rods always show opposite colors, and move simultaneously with the greatest rapidity, the white disappearing from one slot and reappearing in the other in a way which gives the impression that it has swept over the section between them. The illusion is absolute and complete, even when the artifice is understood.

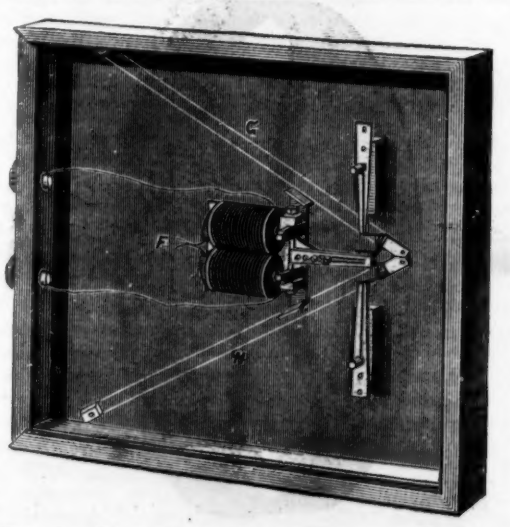


FIG. 3.—ELECTRICAL CONNECTIONS FOR BATON.

The mechanism is shown in Fig. 3. The two rods, *G* and *H*, are centred at their ends, and the inner extremity of each carries a little pulley on which is wound a cord. This cord is connected to the armature of the electro-magnet, while at its other end it is drawn taut by a spring which effects the back stroke. Ordinarily the springs maintain the rods in one position (Fig. 2), and the passage of the current puts them into the opposite position. The circuit is closed by the pedal key *A*, Fig. 1, worked by the foot of the conductor. When the conductor presses it the phantom baton falls, and when he raises his foot it rises. These motions are repeated under the eyes of the conductor by the small metronome *D* (shown enlarged in Fig. 4), connected to the wire *C*. The whole apparatus works most successfully.

Electricity in Warfare.

General Sheridan has expressed recently some very decided views on the subject of harbor and seacoast defense, and advocates a system of sunken forts and disappearing ordnance. In the course of his remarks he says:

"Each battery or group of guns should have a main magazine centrally located at a safe distance from the battery, the smaller service magazines for sub-groups of two or three guns being located in the vicinity of the pieces. These magazines should be connected with the central supply and with the guns by covered galleries having tramways or tracks for such cable or suitable cars as will be capable of transporting with facility the modern heavy munitions of war.

"At some central point should be located the boilers, engines, pumps and dynamos required for manipulating the guns, and for training, lighting and other purposes. These should, of course, be thoroughly protected.

"Electrical motors, it would seem, are preferable to either pneumatic or hydraulic apparatus, inasmuch as any injury to the electrical connections can be much more rapidly repaired than in the appliances by which hydraulic or pneumatic power is transmitted. Furthermore, a cable for the transference of electric power can be laid in a few minutes, while the pipes required for the transmission of the others, if broken, would involve much more time and delay.

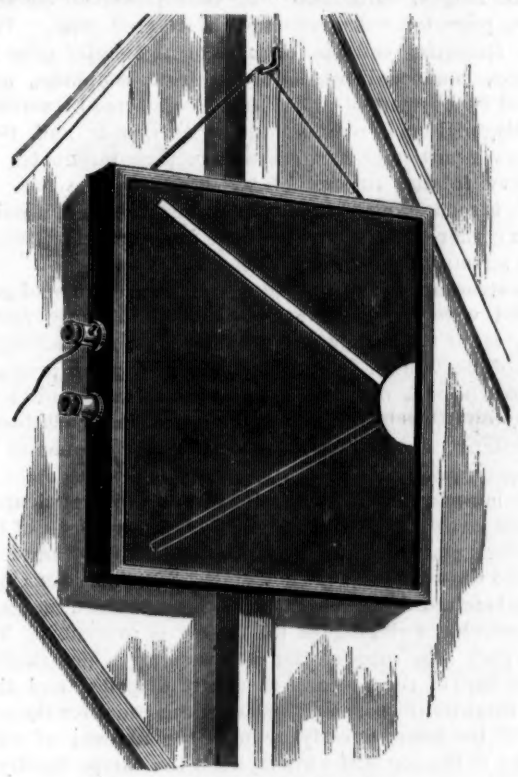


FIG. 2.—POSITION OF BATON.

"It is only fair to state, however, that electric power presents disadvantages when compared with pneumatic or hydraulic systems. Where it is in use dynamos must be kept in constant motion, while with pneumatic or hydraulic plants reserve power may be stowed in accumulators. Should, however, reliable storage batteries be devised, and it is said that such are now available, this objection to the use of electrical power will be removed. Electricity will necessarily be required for lighting the magazines and galleries, and should the work be assaulted the approaches would also have to be illuminated."

The Brussels Telephone Exhibition.

This exhibition, we learn from our Brussels correspondent, promises to be a notable success, over 40 leading telephone makers and inventors being represented. The official opening took place on Jan. 14, when the Board of the Society of Belgian Engineers and M. Varey, representing the French Ministry of Industry and Commerce, were present. M. Van den Peereboom, Belgian Minister of Telegraphs, visited the Exhibition on Jan. 16. M. Berliner, of Hanover, brother of Mr. Emil Berliner, of Washington, exhibits a new microphone of his invention, said to be among the best in the collection. The Bell Company of Antwerp has sent a large variety of instruments of first-class workmanship. The Telephone Construction and Maintenance Company of London also has on view some Bell-Blake and Gower-Bell loud-speaking sets.

The Society of Engineers has applied to the Queen of Belgium for the loan of her "microphone plant," to connect with the Brussels Opera-House certain evenings in

the week. The Society also expects to get occasional use of the new Brussels-Paris telephone line, and some of the more sanguine members are hopeful of getting communication with the Opera-House at Paris. Some official trials and practical experiments will be made, and the prospect is that the Exhibition will be productive of good. Full reports of the proceedings will be published in the *Ingenieur Conseil*, the official organ.

Batteries for Incandescent Lighting.

To the Editor of The Electrical World:

SIR: Could you inform me if 4 cells of battery plates, 4½ × 1½ inches, two carbons and one zinc would light a 3 c. p. lamp; and about what length of time, with 1 quart of solution for each cell? W. B. C.

MINNEAPOLIS, Minn.

[ANSWER.—Your cell will light a 3 c. p. lamp for about 6 hours.—EDS. E. W.]

The Indianapolis Jenney Electric Light Tower.

In our issue of May 8, 1886, we noticed the advent of this new claimant for public patronage, and called attention to some of the advantages claimed for it, as compared with structures previously erected for this purpose.

During the past few months numerous valuable improvements, designed to increase the efficiency of the tower system, have been added, and we are glad to learn that the success of the Jenney Electric Company, of Indianapolis, in the introduction of this tower or mast has exceeded even the most sanguine expectations of the company.

The accompanying cut, Fig.1, illustrates this improved tower, showing a light, strong and graceful structure, 125 feet in height, surmounted by four powerful electric lamps, provided with reflectors of silvered glass. The main structure consists of a central tubular mast in sections, connected by malleable iron couplings, and trussed by a system of radial struts, connected by vertical and diagonal brace rods, arranged as chords and ties. The lower portion of this trussed structure terminates in a heavy tubular column of wrought iron, the base of which is secured upon a pier of masonry, located usually at the corner of the sidewalk at the intersection of two or more streets, as shown in the engraving.

The structure is firmly braced by means of guys of galvanized wire rope, connected by suitable guy posts, firmly set at the curb line of the sidewalks. This arrangement of location for foundations and guy posts presents the least possible obstruction to business, travel and view. At the top of the tower is a hexagonal grating or platform, and railing, provided for the safety and convenience of the attendant.

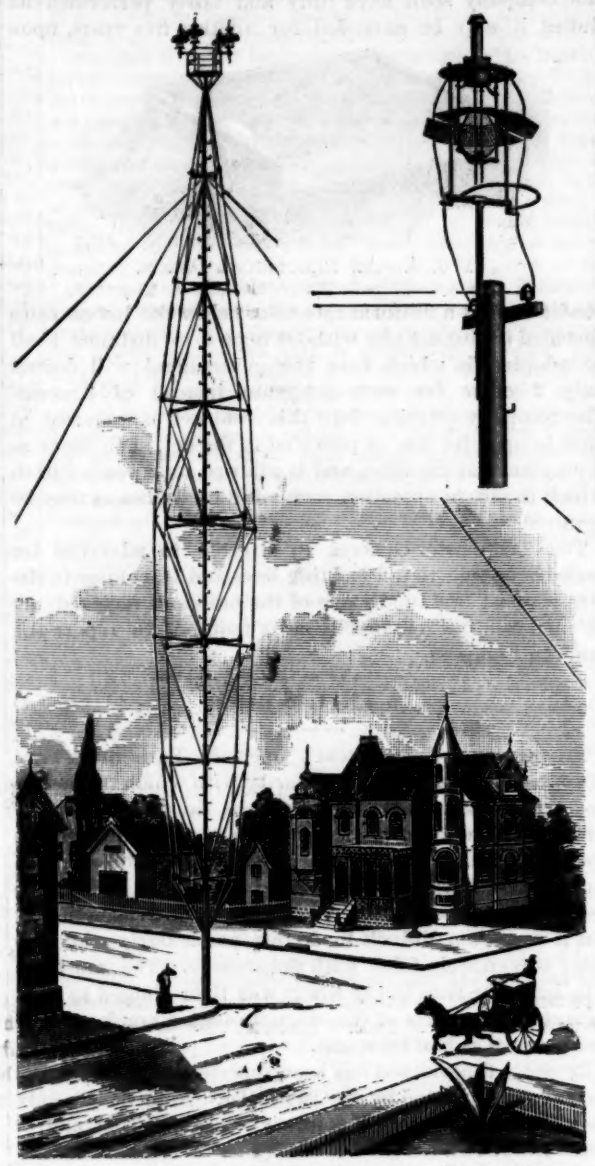
The lamps are supported in iron frames, mounted upon pivoted arms, extending from the railing posts of the trimmer's platform. To the tops of these lamp-frames are secured the switch-boards and electrical connections, and to the side rods are secured the clamps by which the usual disagreeable swinging of the lamps is prevented. The side rods also support the reflectors, by which shadow at the base of the tower is effectually dispelled and that area brightly illuminated. This arrangement for the support of the lamps greatly reduces the amount of wind surface at the top of the tower, holds the lamps rigidly in their proper position, permits the use of any desired number of lamps, wipes out the shadow at the base of the tower, and adds materially to the appearance of the structure. Upon the central mast, at proper intervals, are secured malleable iron steps by which the attendant may climb to the top. This tower was designed by Mr. J. S. Adams, the veteran inventor and builder of electric light towers.

Four sizes of these towers are now being built, viz., 75, 100, 125 and 150 feet in height. For the support of lamps upon the tops of wooden poles, the lamp frame, or standard previously described, attached as shown in the accompanying engraving, Fig. 2, is perhaps the best and cheapest device now in use. The wooden cross arm forms a convenient step upon which the trimmers may stand. The iron band attached to the bottom of the frame forms a safety railing, within which he may securely work, using both hands: the tubular extension adds to the height of the pole, and consequently to the effective range of the light from the lamp, and also greatly decreases the area of shadow from the cross arm and top of the post; and the reflector obviates the shadow of the base of the lamp, and thus removes the greatest obstacle to effective and economical illumination.

The Jenney Electric Company are also building an improved mast arm. As indicated at the beginning of this article, the primary design of these various improvements is to increase the efficiency of the "high lighting" system by the use of means affording a more uniform and satisfactory distribution of the light.

As an appliance for the illumination of a town or city, an electric lamp is valuable in proportion to the work it performs, or, in other words, to the number of gas or oil lamps it displaces, and past experience plainly shows that its capacity in this direction depends very largely upon its surroundings and its position with reference to them. The rapidly increasing demand for towers, masts and other elevated supports for lamps, notwithstanding the materially increased first cost of plant consequent upon their use, is due to the fact that the average amount of work performed by tower lamps is more than double that performed by lamps as ordinarily placed on poles.

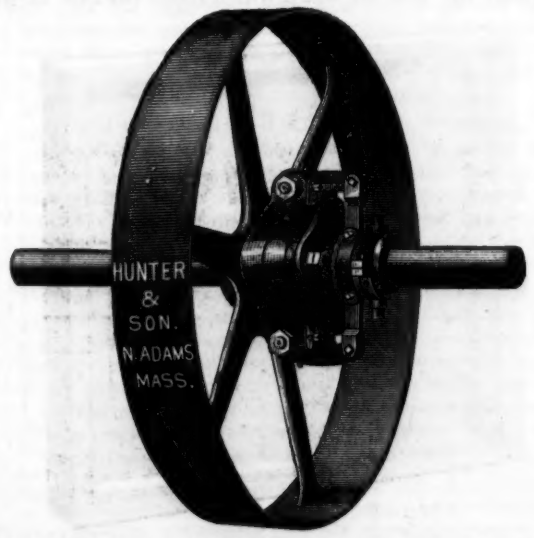
A careful comparison of the work performed in this country by lamps of equal power, shows that the average displacement of gas lamps by electric lamps on poles of ordinary height does not exceed six to one, and that the average displacement by tower lamps is from twelve to sixteen to one. A system which enables a given number of lamps to more than double their capacity for the illumination of a given area is certainly worthy of the consideration of all parties interested in the subject of city lighting.



FIGS. 1 AND 2.—IMPROVED INDIANAPOLIS JENNEY TOWER AND POLE FRAME.

Hunter's Friction Clutch Pulley and Cut-Off Coupling.

The Hunter friction clutch, which is well adapted to the driving of dynamos placed on the same line of shafting, has already been noticed in these columns, but has recently undergone some improvements which enhance its efficiency. The new clutch, which is shown in the accompanying illustration, has two sets of tightening screws and levers, which makes the design more symmetrical and the clutch more powerful and better balanced. Clutches of this form are in use transmitting from 1 to 400 horse-power, with good results. The arrangement is so constructed as to allow the pulley to revolve on the shaft, or the shaft to revolve in the pulley, so that all unbalanced parts remain at rest when the clutch is disconnected.



NEW FRICTION CLUTCH PULLEY AND CUT-OFF COUPLING.

Lima, O.—The Van Depoele Company has just contracted to equip the Lima Street Railway & Power Company for six cars and three miles of road on the Van Depoele system.

How the Indiana Telephone Law Works.

An able memorial against the Indiana telephone rental law has been presented to the Legislature of that State by the Central Union Telephone Company, signed by its President, Mr. G. L. Phillips. It gives so interesting and detailed a statement of the case that we print it in full:

The Central Union Telephone Company respectfully present this memorial to your honorable body, and petition that you will repeal the act entitled "An act to regulate the rental allowed for the use of telephones, and fixing a penalty for its violation," approved April 13, 1885, for the following reasons:

First, The experience for eighteen months of the practical workings of this law, in all portions of the State, has demonstrated that the interests of the public, particularly that portion of the community who desire and need telephonic service, have not been promoted by this Act.

Second, The necessary and practical effect of the law has been to deprive of telephonic service many communities where it was a great convenience and value to a limited business interest, and to stop all extensions of the system in this State.

Third, Telephonic service, whether by exchanges, or by what is known as toll lines between distant points, is of such a nature that the cost is very different under different conditions, and between different points, and the benefit received is not the same; so that a rigid rule, or fixed price for all, is fair neither to the company nor to the customer.

Fourth, The law in question requires all business to be done by all the toll lines and exchanges in this State, with a few exceptions, at an actual operating loss.

When this act was passed there were in Indiana six different companies or persons operating telephone exchanges.

1. The Cumberland Company, operating exchanges at Evansville and adjoining towns, nearly all of which have been closed in consequence of the passage of the law. Evansville had an exchange of about 600 subscribers. Endeavoring to run under this law, various economies were necessary and night service was stopped, whereupon the City Council demanded its resumption. This demand not being complied with, they proceeded to cut down the poles about the exchange, thus destroying the telephonic service not only of the company's subscribers in Evansville, but of all that portion of the State, embracing some 108 toll stations, which depended upon the lines running into the Evansville exchange for their only means of speedy communication with other parts of the State.

2. The exchanges at New Albany and Jeffersonville. Both were closed by this law, although some telephonic communication has since been kept up by way of Louisville, in the adjoining State.

3. The City and Suburban Company, having exchanges at Lawrenceburg and Aurora. These exchanges, never profitable, have been closed since the law took effect.

4. L. Johnson, of Vincennes, operating exchanges at Vincennes, Seymour, Shelbyville and adjoining points, These exchanges have been kept open, but have not been sufficiently remunerative to justify necessary repairs on the toll lines running into them, or to provide for such renewals of plant as are necessary.

5. The superintendent of the company operating the counties of Lake and Porter reports the effect of the law upon them as follows:

"All exchange lines are closed except those at Valparaiso. At Valparaiso, the exchange was closed, all contracts canceled and instruments removed. Subsequently they were restored as an experiment, and toll agents were employed, with a five-cents switching charge. This has proved a failure, the gross earnings from telephones being about forty cents per month. Our manager volunteered to run the thing for a time without pay; but even then it don't begin to pay expenses, and will have to be abandoned if the law stands."

6. The Central Union Telephone Company had some thirty-nine exchanges in other parts of Indiana when this law passed. Five of these were necessarily closed by the requirements imposed; those in the five larger cities have stopped all rental of telephones, and are now operated under the public station toll system. Nearly all the others have been kept along under the charges fixed by the law, and at a continued loss, and have been maintained only in the hope of a repeal of this act.

When this act passed there were 168 towns in the State, exclusive of those containing exchanges, which were connected with each other and the world at large by telephone toll lines owned by the Central Union Telephone Company. We were compelled to, and did close 105 of these stations to save ourselves from certain operating loss. The closing of these stations and lines proved a serious inconvenience and injury to a large number of citizens in the aggregate, but principally to a few important business interests, at any given point. Such places are generally without telegraphic communication, and these business interests have frequently offered to buy tickets in advance, whether used or not; and so, and otherwise to guarantee sufficient patronage to justify the operating of the lines. In such cases we have reopened twenty-six of such stations, which would not now pay expenses without such guarantees.

When the law was passed we had over 100 applications for new telephone toll stations, the material for many of which was ordered. This law stopped all telephonic im-

provements and extensions in this State; nor will business prudence justify the re-building of many toll lines which have fallen down.

Before the passage of this law it was urged that a decrease of price would increase the use of our toll lines. Such has not been the result. The number of messages has not increased, and the gross receipts are very much less. Under the most prudent economy we know how to practice, the whole telephone business of the Central Union Company in the State of Indiana, including all exchanges and toll lines, for the quarter last reported, ending September 30, shows an actual operating loss of $359.75. This is a fact without any allowance for depreciation of plant, or interest on the money invested, and represents only current cash receipts and expenses. If the repairs had been maintained as they were before the passage of the law, the loss would have been much greater.

Telephonic enterprise was, perhaps, too sanguine in establishing exchanges in more than a score of towns in Indiana, where, at former prices, the number of subscribers obtained could not make them self-sustaining; yet the Legislature cannot wish to deprive the public of these facilities, nor us of the ability of protecting our investments.

We respectfully submit that any amendment to this law is unjust that requires us, at a fixed price, to furnish something the construction and operating cost of which varies so greatly. The Legislature does not require railroads to carry a passenger from Michigan City to Jeffersonville for the same charge as for carrying him from Kokomo to Indianapolis! And, as to exchanges, if it be remembered that each subscriber must have a separate and independent wire; that some will be near by and others several miles distant; that some can have wires on poles already established, while for others new lines of poles must be built, useless for other purposes, or when such subscriber quits payment, common fairness must admit the injustice of any rigid and fixed price, and that forbids all freedom of contract which the parties are satisfied to make. We wish to give exchange lines to all who apply; but we dispute the justice of a law which compels us to build lines for parties who will not continue the use long enough to pay more than a small fraction of the expense of construction alone.

The courts have said that "if the law should prove either unjust or inexpedient, the appeal must be to the Legislature alone." We respectfully submit that a trial has shown the results of this law to be such as the Legisture did not contemplate or intend, and we therefore ask its repeal.

The Incandescent Lamp in England.

oTthe Editor of The Electrical World:

SIR: The statement made on page 7 of your issue of Jan. 1 by "a gentleman identified with the Edison interests," about the position of incandescent lamp affairs in England is wholly misleading. He states that "in England to-day you will not find a single incandescent light company except the Edison company of Great Britain." The fact is, that incandescent lamps are made and supplied in large quantities by several firms—by Messrs. Shippey Brothers, by Messrs. Woodhouse & Rawson, by the Anglo-American (Brush) Corporation and by Mr. Kennedy. The lamps turned out by the Anglo-American Company (on Lane-Fox's patents) are of remarkable perfection. Again, your misinformant says that "throughout the kingdom not a newspaper or other publication can be found containing an advertisement for the sale of an incandescent lamp other than that of the Edison." The facts are quite different from this statement. For example, taking the current number of the London *Electrical Review* there is on page iv. of the advertisement sheets the advertisement of the Bernstein lamp, on page xi. that of the Woodhouse & Rawson lamp, on page xix. that of the Alexander lamp, and on page 2 of the supplement that of the Anglo-American Company's "Victoria" lamp. Every other electrical newspaper in England contains similar announcements. As for Edison's alleged "victory" in litigation in England, the case is still in the Appeal Court, judgment being expected in a few days and the betting heavily against the Edison interest. Moreover, it will not be forgotten that the Edison company lost two of the cases which they brought forward on Swan's and Gimingham's patents, and only gained on one of the other two because they owned Sawyer and Man's patent. It is a strange commentary on the claim of Edison to be the sole inventor of the incandescent lamp in 1879, that the Edison Company should use as their weapon the Sawyer-Man patent of 1878 which they have bought up for England; if the Edison Company of England win in the long run they will win because in 1878 Sawyer invented that which made the incandescent lamp practical. That is the true significance of the alleged British "victory."

LONDON. FILAMENT.

Avellino, Italy.—A contract for the electric lighting of Avellino has just been concluded between the municipality of that town and Messrs. Taddei, electrical engineers, of Turin. The installation will consist of 250 incandescent Cruto lamps, viz., forty of 32 candle-power, thirty of 24 candle-power, eighty of 16 candle-power and 100 of 10 candle-power each. The Piazza della Libertà will be lighted by arc lamps of 250 candle-power. The current will be furnished by Thury dynamos.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, Jan. 31, 1887.

The second annual report has just been published of the Serial Building Loan and Savings Institution of this city, in which so many telegraphers are interested. There are now four series including 298 members and 53 borrowers, and representing 1909 shares of stock. The amount of mortgages is $37,350. The net value of the four series is put at $42,246.29. The society is in excellent shape and its success is a flat and final reproof of those who speak of operators as an improvident class. The officers and directors for the ensuing year are: James Merrihew, President; E. F. Howell, Vice-President; A. R. Brewer, Treasurer; W. B. Marsh, Secretary; John Van Horne, D. B. Mitchell, E. F. Cummings, C. P. Bruch, M. J. O'Leary, Thomas Brennan, Wm. Holmes, J. M. Phelan, George Dauler, John Brant, W. B. Waycott, Directors; J. B. Sabine, Attorney for New York; A. A. Rich, Attorney for New Jersey.

The annual meeting of the Gold and Stock Life Insurance Association was held in Room 52, Western Union Building, Jan. 10, and was well attended. The financial standing, as shown by reports, is much improved. No change was effected in the constitution or by-laws.

The following officers and directors were elected for the ensuing year: R. J. Hutchinson, President; A. J. Driver, Vice-President; W. J. Dealy, Secretary; M. Breslin, Treasurer; E. F. Cummings, E. T. Fisher, W. H. Collins, T. J. Sullivan, D. E. Pike, Directors.

Since the meeting a large number of applications for membership have been made, and the year bids fair to be a very successful one for the society.

The Electrical Supply Company's new "No. 19" button is one of the neatest push buttons ever placed on the market. It is plainly finished, but has a highly polished oval brass top with ¼-inch flange. No screws are shown on the surface. All the parts are first class. Platinum points are used. The company are about putting on sale a new disc battery for which they claim great things. Among their novelties and recent receipts are a new line of iron frame bells, and a variety of test instruments, voltmeters, ammeters, galvanometers, etc.

I do not wonder that since the late awful smash up on the Baltimore & Ohio the superintendent of that road has been examining into the merits of the Phelps railway telegraph system. It is about what he wants.

The National Electric Service Company, of 686 Broadway, has issued two neat little brochures as to its system of regulating temperature. One is "Just Warm Enough," by Justus Wilcox, and the other is "An American Woman's Opinion," from *Harper's Bazar*. The company is doing splendidly, and is adding daily to its long list of patrons and testimonials.

The shafting department of the Edison Machine Works, H. M. Livor, manager, with offices at 121 Chambers and 103 Reade streets, this city, has issued this month a very complete catalogue and price list of turned and finished shafting, pulleys, hangers, couplings, belting, etc. It has special facilities for manufacture, and carries a large stock of finished material. Its patterns are the latest and best, and its machinery is specially adapted for the production of superior and accurate work.

It is worth while to note that the Fuller-Wood Company are offering a number of "improved Gramme dynamos," of from one to fifty light capacity, at greatly reduced prices. These machines are all of well-known pattern and capable of good service. A complete equipment of lamps goes with the machines, or dynamos and lamps can be had separately.

The Kings County Grand Jury (Brooklyn) has at last made a presentation as to the relations between the electric light and telephone companies and the public officials, chiefly connected with Mayor Whitney's administration. One passage says: "We find that officials of the city are stockholders and officers of private corporations, using their official influence and positions to aid such corporations, and this calls for condemnation at our hands, if we cannot do more. We find the Common Council of the city granting a charter to an electric light company amid circumstances pointing to corruption; extending the lighting limits to such an extent as to exhaust the fund set apart for the work long before the expiration of the year, and then deliberately drawing $62,000 from another fund to meet the indebtedness. And again we are powerless, because, it is said, the laws are not such as to meet the issue as it comes before us." Then, the New York & New Jersey Telephone Company gets a dig. "We find from the evidence taken that the Brooklyn Fire Department have tolerated gross irregularities in their business methods with the New York and New Jersey Telephone Company, which, if they do not amount to a conspiracy to defraud the city treasury, do enable the New York and New Jersey Telephone Company to circumvent the law. . . . We find that Mayor Whitney has unwittingly in his message shielded his subordinates by representing that the New York and New Jersey Telephone Company was paying the city for the use of the poles. . . . We cannot too strongly condemn a system whereby private individuals or corporations are allowed to hold valuable privileges subject to the caprice of any officer or department. . . . While the jury have not been able to discover that any money or other consideration has been paid the Fire Department, they deem that the advantage gained by them to the telephone company is much greater than that received by the city."

The Electric Subway Commission are also censured for not providing plans promptly for putting all wires under ground. In conclusion the Grand Jury says:

"We are satisfied as to the wrongdoing of the parties implicated, but it is not clear, under the interpretation of the law given to us by our legal adviser, that we have the right to indict, but we make this presentment as a warning to all offenders, and that the Legislature of the State may be justified in taking action in the matter." It is needless to say that the individuals and companies concerned "talk back" pretty vigorously, alleging that the attack on them is mainly a political one. Of course I need not point out the absurdity of the strictures on the Subway Commission. I am inclined to think that the matter will not go much further

Mr. George W. Stockly, of the Brush Electric Company, was in town last week, and being interviewed said:

"The one requirement of a subway in which electric light wires may be placed is that it should be secure from dampness. If dampness accumulates on the wires and is allowed to remain, it creates high tension electricity that jumps over the wires and destroys the light. I have spent a great deal of time in examining the different systems, but have not yet found any that is sufficiently perfect for electric light wires. The Dorsett system is all right in other respects except this. The subway which they laid in Sixth avenue is already leaking, and it seems impossible to make it perfectly water tight. We are agitated over this question in Cleveland, and we had a commission on here to examine the various systems. They have concluded to await developments before taking any special action. I think they have taken the part of wisdom. Experiments will undoubtedly bring about a pefect system of subways for wires, and no one will welcome it more heartily than the electric light people." Referring to electric light matters, Mr. Stockly added: "We have never been so busy as at present. The West and South are great fields for new plants, but the notion that the growth is entirely in that direction is erroneous. In the last three months we have placed over $100,000 worth of apparatus in the East. We are reaching out to Europe, South America, Australia, China and Japan. The original capital of our company was $100,000. It has been raised at different times until it is now $2,000,000; the last increase was made for the purchase of Mr. Brush's patents. He is now under contract to furnish us all his new inventions as long as the company is in existence and while he is alive. That means a good deal, for he is only a young man, much under forty years of age, and as ambitious to produce new results as when he was a struggling inventor. The latest new field of operation has been in the direction of motors, the power for which may be located at long distances away from the place of action. They require such motors in mines, and the same systems can be operated upon street railroads. We have just shipped a number of motors to Denver to be used upon a street railroad. In mining, the engines which supply the power may be located a mile or two away from the place where the power is used."

Messrs. Chas. A. Schieren & Co., manufacturers of the "Electric" leather belting, have secured the contract for furnishing their belt to the plant in the Honolulu Palace of the King of the Sandwich Islands. By the way, when the Honolulu potentate can thus be given his electric light, isn't it time something was done in the same way for the White House? The "Electric" belting is now in use by a large number of electric light companies, and the firm have collected their opinions and testimonials in a neat and convincing pamphlet.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Jan. 31, 1887.

The citizens of Bar Harbor, Me., have petitioned the authorities of that town for arc and incandescent electric lights.

The Ludlow (Mass.) Manufacturing Company has added six new water-wheels to the equipment of its large mills; two are to be used to furnish power for electric lighting purposes.

Messrs. Remington & Henthorn, for several years connected with the engine works of Geo. H. Corliss, Providence, R. I., have established themselves in pleasant offices on Westminster street, in that city. General engineering is the special branch of their business.

Of late there has been considerable discussion by members of the Somerville, Mass., City Council as to what company should furnish electric lights for the streets of that city. The systems in use by the local electric lighting companies of Charlestown and Cambridge will be inspected by the councilmen during the present week.

The officials at the central office of the Baltimore & Ohio Telegraph Company, Boston, deny all knowledge of the reported consolidation between that corporation and the Financial Telegram Company; but, if such is a fact, the consolidation must have been effected in New York. A call at the Financial Company's headquarters failed to disclose any indication of a consolidation, but a noticeable fact is that all the principal officers of the company are absent from the State.

The Electric Gas Lighting Company, of Boston, is enjoying a large trade in two of its leading specialties, viz.: the "Victor" call bell and single magnet automatic gas-lighting burners.

The Wainwright Manufacturing Company, 65 and 67 Oliver street, Boston, has just received from the printer its handsome illustrated catalogue in which is set forth a full description of its corrugated tube exhaust feed-water heaters.

On Friday evening, Jan. 28, an electrical lecture and exhibition was given in Sleeper Hall, Boston, under the auspices of the "Philomathean," the literary society of the College of Liberal Arts. The entertainment consisted of addresses by Mr. R. J. Monks on the "History and Growth of Artificial Light;" Mr. M. M. Slattery, of the Sun Electric Company, on "Electric Lighting," and Mr. W. E. Fette, gas engineer, who presented models and drawings of a plant for the manufacture of illuminating gas. Mr. Monks spoke of the different kinds of lamps and exhibited some specimens of ancient work, and alluded to the growing number of electric lights in America. Mr. Slattery then spoke of the three great systems of electric lighting. "The low tension multiple arc system," he said, "was somewhat deficient in that the force could only be transmitted a very limited distance. The high tension multiple series system could be used for longer distances, but could not be turned off and on with equal economy to low tension. The third system, that of high tension multiple arc induction, was the nearest to a success, in that it could be used for long distances and be turned off and on economically."

The circuit and lamps were furnished by the Boston Electric Light Company and the incandescent lamps by the Sun Electric Company. The South Boston Gas Company and others aided the display by the loan of an artistic collection of electroliers, lamps and gas fixtures.

At a meeting of the directors of the New England Telephone and Telegraph Company at Lowell, Mass., Jan. 26, it was voted to pay a quarterly dividend of $1.25 per share on Feb. 15, to stockholders of record Jan. 31. It is reported that the stock books of the company will be closed from Feb. 1 to Feb. 12, inclusive.

The Newton Electric Light and Power Company gave an entertainment at its station, Newtonville, Mass., on Tuesday evening, Jan. 25. About 150 guests were present, and the officers of the company strove to outdo each other in attention and hospitality

to those present. After the equipment of the station had been inspected, and the Thomson-Houston system of arc and incandescent lighting had been comprehensively explained, a collation was served, and followed by speeches from a number of prominent Boston and Newton gentlemen. I am informed that the entire evening's entertainment was a most enjoyable affair.

During the heavy storm at Salem, Mass., last week, the roof of a building adjoining the base-ball grounds was blown into the street, breaking down all the telephone wires in the neighborhood, and interrupting communication between that city and Beverly, Mass.

The New England branch of the Edison United Manufacturing Company (Messrs. Paine & Francis, managers) has made for itself a splendid record of plants installed since the beginning of last fall. Unquestionable statistics show that the above named gentlemen have made an average installation of one incandescent plant per week in the New England States since the first week in September. They have just completed work on a 300 light incandescent plant for the S. Blackington Woollen Company, Blackington, Mass., and a 100 light plant at the mills of the Riverside Paper Company, Holyoke, Mass.

The Brookline Suburban Electric Light and Power Company yesterday consummated the purchase of the Brookline Electric Light Company, possession to be given Feb. 16. The new company was formed about six months ago by the owners of the gas-light company, so that they might be able to compete with and protect their interests against any competitors. The officers are: Dr. Robert Amory, president; Francis W. Lawrence, treasurer; Dr. Amory, F. W. Lawrence, A. W. Blake, W. H. Hill, Jr., W. H. Odiorne, directors. It is understood tat Mr. C. W. Holtzer, the electrician, will be the general manager. W. I. B.

PHILADELPHIA NOTES.

PHILADELPHIA, Pa., Jan. 31, 1887.

Our electric lighting people are all full of business and projected plans for increasing the capacity at the various stations. When the Edison Company get their central station in operation, a boom in this field may be expected.

The National Automatic Fire Alarm Company gave recently an exhibition of their newly invented apparatus at their office S. E. cor. Third and Chestnut streets. The apparatus consists of a thermostat and a repeating apparatus. The thermostat, as is well-known, is an instrument which completes an electric circuit upon the temperature of the room in which it is placed rising beyond a certain regulated point. In this case, a disc of zinc is buckled in the centre and presents a concave surface, whose under or convex face is separated by a small interspace from the point of a set screw. The disc is set in a collar which prevents lateral expansion. Every expansion caused by heat increases the concavity, and if sufficiently extensive brings the under surface of the disc and the set screw together. By insulated wires connected to the disc and to the screw the circuit is completed. Each thermostat in a building is connected with a magnet controlling a detent in the automatic repeater. Upon a current passing through any one of the magnets, a disc bearing a number of contact pegs is allowed to revolve, and as the contacts pass a spring, they send to the fire department a numbered signal giving the number of the building in the first place and then the number of the thermostat that has given the alarm, in that way locating the particular apartment in which the fire exists. Numbers painted on the rotating disc and visible through an aperture of the box repeat this information. The tests made were very successful and showed great delicacy and accuracy in operation.

On the 22d of this month the telephone service of Lancaster, Pa., was temporarily deranged owing to the strike of the female operators of the central office. The difficulty arose from the fact that the company had the lower window panes painted, which prevented the young ladies from seeing what was going on in the outer world, and in order to see, the ladies reversed the sash, putting the painted paines on top and the clear panes on the bottom; the managers then had the lower sash screwed down. The young ladies could not stand this infringement on their rights and consequently struck. I presume by this time, however, things have been satisfactorily arranged.

The firm of Vallee & Brothers, at 1,210 Market street, has been dissolved by mutual consent, and a co-partnership has been formed under the name of Vallee Bros. & Co. at their new establishment, 932 Arch street. They are just starting a large factory for the various electrical apparatus they manufacture. They propose carrying at their new store a full line of supplies suitable for the electrical trade. Their special line of manufactures is electric bells, annunciators, gas lighting apparatus, and burglar alarms.

Shaw & Geary, 53 and 55 North Seventh st., are still busily working to bring out several new electrical appliances, but have so much outside work that it materially retards their progress. They are very active on telephonic and telegraphic work.

At a meeting of the Dental Congress, held in New York during the week ending Jan. 22, the Partz battery, made by the Partz Company, of 1723 Chestnut street, this city, was on exhibition, and was tested with dental mallets. It received the highest commendation for continuous action.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Jan. 29, 1887.

I received a call this week from Mr. Ichisuke Fujioka, M. E., formerly Professor of Electrical Engineering in the Imperial College of Tokio, Japan. He is now making a tour of this country in company with S. Yashima, President of the Tokio Electric Light Company. These gentlemen have now gone East. They came direct from Japan, their mission being to look into American systems of electric lighting with a view of adopting the most practicable for their own country. They have the electric light at present in their halls and docks, and they desire a good system for street lighting. They will take in England and Germany before returning to Japan.

The Hydro-Electric Motor and Power Company has been incorporated here with a capital stock of $500,000. Incorporators: George A. Gage, Ralph Hunt and M. C. Armour.

Mr. W. M. Callender, of the Callender Insulating and Waterproofing Company, New York, was a welcome caller at this office this week. Mr. Callender is in Chicago for the purpose of establishing a western office for his company here. The office will be at 154 La Salle street, room 16, under the management of Mr. William Simpson. I predict a good business for the company out this way.

Cooper & Sigler of this city will put in a Fort Wayne-Jenney arc light plant.

Col. Geo. L. Beetle, of the Western Electric Company, has been spending some time in Chicago and the West lately.

Mr. George S. Bowen has issued the following card:

"I will furnish railroad tickets to parties who desire to attend the third annual meeting of the National Electric Light Association, at Philadelphia, Feb. 15 next, for $20 from Chicago to Philadelphia and return. A special Pullman car ($5 extra) reserved for delegates, will leave the Union depot, Chicago, *via* the Pennsylvania Railway (the finest in the world), Sunday, Feb. 13, at 3:15 P. M., arriving in Philadelphia Monday evening. All should advise me as to their wishes promptly. Any one preferring to leave Chicago on Monday can do so. I will be at the Sherman House, Chicago, Sunday morning, Feb. 13, to arrange with those going that day. I trust a full delegation will go on in company. Ladies are always included and invited."

I believe Mr. Bowen will bring a large and jolly party along with him.

The Van Depoele Electric Manufacturing Company have contracted to equip an electric road four and one-half miles long at Binghampton, N. Y. This road runs from the Insane Asylum through the centre of the city across the bridge to Rou Park, and is the consolidation of two horse-car roads. It is to be equipped with three cars carrying 10 h. p. motors; four cars carrying 15 h. p. motors; and 1 car carrying a 20 h. p. motor. Mr. S. M. Nash, of Scranton, Pa., is the lessee of the road. An overhead conductor will be used, and the road is to be finished by May 1.

The Montgomery (Ala.) Van Depoele company is completing a fine two-story building, and equipping same with two 150 h. p. boilers and two 125 h. p. Porter-Allen engines.

I clip the following from the Appleton (Wis.) *Daily Post:*

At the annual meeting of the stockholders of the Appleton Electric Street Railroad Company the following directors were elected for the present year: J. E. Harriman, R. M. Hunt, G. W. Gerry, N. B. Clark and N. M. Edwards. The Board of Directors at their subsequent meeting elected the following officers: President, J. E. Harriman; Vice-President, N. B. Clark; Secretary and Treasurer, Joseph Koffend. Among the improvements spoken of at the meeting and which were definitely decided upon for next year, are two or three open cars which will be purchased this spring for the summer traffic. It is also proposed next summer to extend the street railway system both north and west. The Appleton street line will then be in operation and it is probable that it will be continued north to Second avenue. The main line also may be extended considerably further west, perhaps as far as Appleton Junction. The main points of superiority of the road over one actuated by animal power are, first, in economy, the cost of running the road being about 50 per cent. less than by animal power. Secondly, the number of miles run by the same car, a days work for a horse-car being 60 miles and of an electric car being 90 miles, and, thirdly, increased patronage on account of rapid transit, neatness of cars and safety. The members of the company are highly gratified at the success of the enterprise.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me the following telephone stock quotations:

Bell of Mo.	$155@$157
Chicago	375@ 400
Central Union	48@ 49
Colorado	20@ 22
Cumberland	80@ 85
Great Southern	30@ 33
Iowa Union	16@ 19
Michigan	71@ 73
Rocky Mountain Bell	40@ 45
Wisconsin	104@ 106
United	18@ 20

W. A. K.

INDIANAPOLIS, Jan. 27, 1887.

Finding myself in Indianapolis this morning, I took occasion to go to the Jenney Electric Company's works to see what there was new or novel out there that would be interesting to the readers of this department. I learned that the factory of this company has been very much enlarged and extended since my last visit. They now occupy, with their arc department, a convenient building, 225 × 50 feet, and three stories in height. The first floor of this building is taken up by two large machinery and dynamo rooms. The machinery in use is the finest that could be obtained for the purpose, and dynamos can be seen in all stages of completion. The second floor is occupied as an armature and winding department. Here also is Mr. Jenney's laboratory, and the room of Mr. Adams, of tower and mast arm-fame. The third floor is the lamp and testing department Besides the main building there are three detached buildings. One of these is for the tower and mast arm department, another for the wood-work shop and the third for the incandescent department. In this connection I will say that the company are going into incandescent lighting very extensively. The services of Mr. A. W. Morrell, so long known in the West by his connection with the United States Company as their superintendent of construction for the Northwest, with headquarters at St. Paul, have been secured, and he will assume full charge of the incandescent department the middle of next month. Mr. Hickley, an unpretending master of his art, gives his entire time to the manufacture of incandescent lamps. The company are equipping with a capacity for 700 incandescent lamps daily, with machines to correspond. Lamps ranging all the way from 16 to 500 c. p. will be made. I understand that one of their 300 c. p. lamps has now been burning 2,200 hours, no signs of exhaustion yet appearing. The company are now giving a good deal of attention to the manufacture of towers, and report late sales very large.

The Jenney Company are very busy in all branches, having more orders on their books than they well know how to take care of. This continued rush of orders will possibly result in the erection of an additional building in the spring.

The Bennett Telephone and Electric Company have removed to No. 15 Circle street, where they have a handsome store on the ground floor. The shops occupy rooms in the rear, and the basement is used for storage purposes. Mr. Bennett finds the new location a great improvement in a business sense. Mr. Bennett's local business is good, and the outside demand for his "Peerless" telephone and other instruments continues to increase.

At the Bates House I met Mr. E. T. Gilliland, with his wife. They leave in a few days for Florida, where they will meet Mr. and Mrs. Edison, and where the party will spend the remainder of the winter.

Mr. John R. Markle, of the Markle Engineering Company, Detroit, and the Edison Company for Michigan and Indiana, is also a guest at the Bates. Mr. Markle informs me that next fall will see at least six more large central Edison stations established in his territory.

The Bates House is splendidly lighted by an Edison plant.

A bill has been introduced in the Legislature here during the past week repealing the telephone law of 1885.

The Rushville, Ind., Electric Light Company filed articles of association with the Secretary of State last Saturday. Its capital stock is $20,000. The Directors are F. S. Smith, F. P. Hall, J. W. Sterdy and C. H. Bailey.

An incandescent electric lighting plant has just been completed and put in operation at Attica, Ind., and now the citizens of that city are congratulating themselves as having the best lighted city in the State. W. A. K.

THE TELEGRAPH.

Madagascar.—The construction of the Madagascar telegraph line from Tamatav to Antananarivo, the capital, is nearly finished.

The Gray Telautograph Company, of Chicago, has been incorporated by Elisha Gray and others with a capital stock of $10,000.

T. M. B. A.—The following appointments of agents have been made: D. C. Sims, Mobile, vice B. P. Shreve, resigned. F. M. Griffin, Philadelphia, vice I. D. Maize, resigned; C. H. Kelly, St. Paul, vice G. B. Evans, resigned.

Another Mackay Line.—John W. Mackay, of the Postal Telegraph Company, has purchased the Bay and Coast Telegraph Line, belonging to the South Pacific Coast Railroad Company, which runs from San Francisco to Santa Cruz. The price paid is not given.

A Ball at Erie, Pa.—The telegraphers at Erie, Pa., gave their annual ball on Jan. 25. It was an immense success. Fully 400 couples participated, and large parties of visitors came from Cleveland, Ashtabula, Painesville and other points. The ball, which was given in the Scott Music Hall, was followed by an elaborate supper at the Arlington Hotel.

Boston, Mass.—Mr. J. Harlow, the cashier of the Western Union Company at Boston, has been replaced by Mr. J. H. Wentworth, of Portland, Me., a serious deficiency having been found in the former's accounts. It is said that the amount will reach at least $3,500. As far as can be learned, Mr. Harlow has been more sinned against than sinning, and has suffered from trying to cover the shortages of some of his subordinates. Mr. Harlow now lies very sick in Boston.

The French Cable Broken.—Superintendent Fisher, of the French Cable Company, received a dispatch from the company's Superintendent at St. Pierre, on Jan. 26, stating that the cable had broken in the deep sea line between St. Pierre and Brest. The exact location of the brake has not yet been determined, but Mr. Fisher supposes it is at a point where the cable had already twice been broken. He ascribes the break to icebergs. The cable, he thought, had been ground between a couple of bergs, for this had been its fate before. Just at this juncture the break was most unfortunate, he said, as nearly a month would elapse before it could be repaired. The repair steamer, the Pouyer-Quertier, is at Havre. Before she is fitted out and can reach the scene of the break at least 12 days will elapse. The rest of the month would be occupied in grappling the ends and making a connection.

The Ticker War.—Among the matters upon which it was supposed the Governing Committee of the Stock Exchange would take action last week was the case of the Commercial Telegram Company, which is now fighting the Exchange in the courts. Members of the committee denied that any action had been taken, but it is understood that a communication received from Philip Bruns by President James D. Smith was laid by him before the committee and placed by the latter in the hands of a sub-committee for consideration. In his communication Mr. Bruns, who has been a member of the Exchange since 1869, takes very strong ground in favor of the debarred company and denounces the report of Mr. E. A. Drake, which favored an exclusive service by the Western Union Company, as "the outgrowth of a conspiracy." The question at issue he considers of vital importance to the Exchange, as well as to the public. He warns the Governing Committee that it has been deceived, and alleges that it has been led to favor secrecy in order that the conspiracy to give the Western Union a monopoly of the ticker service might succeed.

THE TELEPHONE.

Level-headed Ohio.—The bill to limit telephone rates has been defeated in the Ohio Senate.

Syracuse, N. Y.—This territory has passed back into the hands of the American Bell Company, but the old licensee, Mr. Myers, threatens to give trouble.

At It Again in Illinois.—Among the bills introduced in the Illinois Legislature on Jan. 28 was one prescribing certain duties of telephone companies, prohibiting discrimination between patrons, to regulate the rental allowed for the use of telephones and fixing a penalty for its violation. Two dollars and fifty cents per month is the outside rental which may be charged an individual or corporation for a single telephone.

A Proposed New York Commission.—Mr. Ives, of New York, has presented a bill in the Legislative Assembly creating a Board of Telephone Commissioners composed of three persons, to be appointed by the Governor and Senate, and to hold office three

four and five years, the terms of their successors to be five years each. The board shall have a secretary and a marshal to serve notices and other papers. The main office shall be in Albany, with branch offices at New York and Buffalo. The board shall have the general supervision of all telephones and telephone lines, and shall examine the same and "keep themselves informed as to their condition and the manner in which they are operated, with reference to the protection and accommodation of the public, and the compliance of the several corporations with the provisions of their charters and the laws of the State." The board shall also investigate complaints about the management and charges of the companies. The telephone companies are required to make semi-annual reports to the board of the amount of capital actually expended in their business, the total amount of money received from the public for the use of telephones, the amout of money received from any other source, the amount expended for telephones, telephone wires, labor, material, ordinary and extraordinary repairs; for improvements, purchases of property, specifying whether of a permanent character or not; for tools, machinery, or other plant; for salaries, management and general incidental and other expenses; for dividends, interest and other purposes. The report shall also show "what part of such capital or money so expended and received, was expended or received in every locality in the State where telephone communicatien is estab lished. The board is given the power to make examination of books and papers and take testimony from witnessess. The Commissioners may recommend improvements to be made by the companies, but it has no power to enforce its recommendations. In this respect it is on a footing with the railroad commission, the law creating which has been largely followed by Mr. Ives. The bill has a stipulation that the telephone tolls shall not exceed $4 per month in localities where companies are earning 10 per cent. upon the amount expended in establishing their business. The salaries of the Commissioners are fixed at $4,000, the Secretary at $2.500, and the Marshal at $1,500. The sum of $50,000 shall be annually assessed upon the telephone companies for the payment of the board's expenses.

THE ELECTRIC LIGHT.

Patchogue, L. I., is to be lighted by electricity.

Hartford, Conn.—The Hartford Light & Power Company, incorporated by D. Henry and others, has a capital stock of $10,000.

Car Lighting.—The Railway Electric Car Lighting Company of Chicago has been organized with capital stock of $100,000 by J. J. Veeder and others.

Newburgh, N. Y.—The Consumers' Gas Company will, it is said, make a deal for a combined plant with the American Electric Manufacturing Company.

Toledo, O.—The Western Electric Light & Power Company, of Toledo, O., has been incorporated by J. T. Kumler and others with a capital stock of $200,000.

Mt. Vernon, N. Y., is now lighted by the American system, and the American Illuminating Company of that town has been incorporated by J. Dawson and others.

American Exhibition, London.—The work of building the exhibition is to be carried on at night by the aid of a special electric lighting plant. Four hundred men are now engaged.

Experts in Council.—The "experts in training" and others engaged at the Brush Works, Cleveland, have formed a club which meets once a week and discusses topics that pertain to electrical engineering.

The Big Brush Dynamos.—The two new big Brush machines building at Cleveland for the Cowles Company, of Lockport, N. Y., will have armatures 42 in. in diameter, and the machines when complete will weigh about 10 tons apiece.

The Marblehead (Mass.) Gas and Electric Light Company has chosen officers as follows: President, W. Eliot Fette; treasurer and clerk, R. J. Monks; directors, William Humphreys, Edward Jones, William E. Ford, R. J. Monks and W. Eliot Fette.

Electric Lights in Harlem.—The application of the Harlem Lighting Company to be allowed to light Third avenue from Eighty-sixth to 125th street by electricity, free of cost to the city, was offered by Alderman Mooney last week at a meeting of the board, and referred to a committee.

Another Company for Rome, Italy.—A cable dispatch from London, of Jan. 25, says: A company of Italian capitalists has undertaken to light Rome by electricity under a new system. The plant of the company will be operated by water-power furnished by turbine wheels in the Tivoli waterfalls.

Turners Falls, Mass.—The electric light industry is growing at Turners Falls. The Montague Company has installed a larger incandescent plant of 218 lights; the Turners Falls Paper Company is now running a dynamo of sixty-three lights, and the Griswold Manufacturing Company is getting estimates for lighting its big cotton mills.

The Seaweed Carbon Company has been incorporated at Portland, with a capital of $200,000. It is composed of Massachusetts men, with Edgar Shaw, of Lynn, at the head, and will develop the new inventions of Mr. Shaw, for making carbon for electrical purposes out of the common seaweed stuff of the sea. A description of the invention was given lately in these columns.

Westbrook, Me.—The Congregational Church at Cumberland Mills, Westbrook, which has been enlarged during the past year, will be lighted by incandescent electric lamps, the electricity being furnished by the dynamos at the Cumberland paper mills. This will be the first instance in the State of a church being lighted by electricity.

Providence, R. I.—During some recent labor troubles at the works of the Moss Manufacturing Company, Westerly, R. I., it was deemed desirable to put an arc light near the mill. This was done by Mr. G. H. Adams, the electrical engineer, who rigged up a 2,000 c. p. light, which had the effect of at once lighting, quieting and protecting the neighborhood.

Better for the Mummies.—According to the author of "She," mummies make excellent flambeaux, but it is now seriously proposed to save the mummies and their resting places by lighting up electrically the largest temples, tombs and pyramids in Egypt. It is said that the ordinary torches carried by Arabs and tourists greatly disfigure the inner chambers.

A Southern Pooh-Bah Company.—The Kentucky & Arkansas Land and Industrial Company, lately incorporated at St. Louis, intends to do anything and everything in the exploiting line, and is ready, for one thing, to push the electric lighting business in the South. The incorporators are: G. L. Danforth, J. G. Caldwell, B. H. Young, J. G. Smirall, J. D. Adams and C. M. W. Lewis. The capital stock is $2,500,000.

Attica, Ind.—The Markle Engineering Company had the satisfaction of seeing the Attica, Ind., plant, installed by them, go into operation on Jan. 15, when about 300 Edison lights were started up. The plant is to be increased. A number of the leading business men are using the light, as well as the post-office and hotels. The 300-light Edison machine is driven by a fine 80 h. p. Buckeye engine. Mr. C. E. A. Reubel erected the plant for the company. The local parties chiefly interested are Messrs. L. F. Putnam and J. J. Little, who propose equipping for street lights and to begin wiring residences.

West Chester, Pa.—At a meeting of the board of directors of the Edison Light Company, held last month, the reports of the superintendent, the finance committee and treasurer were read and approvod. The directors then declared a dividend of 5 per cent., payable on the 15th of March. The company has now been running fifteen months, and this is considered an excellent showing. The officers are at present: President, R. T. Cornwell; Secretary, H. M. Phillips; Treasurer, D. M. McFarland; Superintendent, Walter Embree. The following directors were elected: R. T. Cornwell, R. E. Monaghan, Isaac Massey, Henry C. Baldwin, Abner Hoopes, Curtis H. Hannum, Thomas B. Brown, Jos. S. Evans, Frank P. Darlington.

Asbury Park, N. J.—A meeting of the stockholders of the Lane Spring Hinge Mfg. Co., Asbury Park, N. J., was held last week for the purpose of reorganization. The company will hereafter be known as the Asbury Park Electric Light & Power Co. The manufacturing department will be disposed of, and they will hereafter give their entire attention to electric lighting and the furnishing of power by electric or steam motors. One of the objects of the reorganization is to reduce the capital stock to a cash basis. The capital stock is now $50,000, with $27,000 issued, and the balance of $23,000 will be sold as needed for the purpose of increasing the business. The company now have in contemplation the addition of 50 arc and 500 incandescent lights. A statement was made of the past year's business, which showed net earnings of about 10 per cent. upon the capital invested.

In the Navy.—The adaptability of the elcctric light for use on board ship has been demonstrated to the satisfaction of the Navy Department, and every vessel hereafter constructed, as well as those now about completed, will be provided with the apparatus necessary to produce the light. Lieut.-Commander R. B. Bradford, the recently appointed Inspector of electrical apparatus for the navy, has been in Washington looking over the contract and specifications for putting electrical lighting apparatus on board the "Chicago." He will give the work his personal supervision, and see that the specifications are followed in every particular. He is considered an expert in his new line of duty. It was under his direction that the "Trenton" was fitted out with an electric plant. She was the first vessel in the navy to be provided with the light. Lieut.-Commander Bradford afterward sailed on the "Trenton" as her executive officer, and had three years in which to study the practicability of the electric light on vessels at sea. Before he is relieved from his present duties he will have charge of the arrangements for introducing the electric lighting system on the vessels about to be constructed.

Belvidere, N. J.—A special dispatch of Jan. 22 says: This town was in a turmoil the greater part of last night, and several times a conflict between the county authorities and the employés of the electric light company was imminent, and only averted by the final submission of the workmen. Since Dec. 7 gangs of men have been erecting poles, stringing wires, setting up engines, and doing other necessary work preparatory to a change from the ancient kerosene to modern electricity. This work was done under the supervision of Jesse W. Starr, Jr., of Philadelphia, who entered into a contract with the city to furnish machinery capable of manufacturing 75,000 cubic feet of gas per day, to lay four miles of pipe, and to erect and supply for the use of the town 25 gas jets and 31 electric lights of the most improved pattern at the ridiculously low sum of $750 per annum, the town in return giving him a monopoly of the business for 12 years. Yesterday all arrangements for making the first trial were completed, and Belvidere expected to be well lighted by Monday night next. But last night a large body of men under the direction of an employé named Foster, began on the outskirts of town to cut the wire from the poles. They were acting under orders of the Holbrook Manufacturing Company, which had furnished supplies to the electric light company. A number of creditors swore out attachments against the property, and delivered the writs into the hands of the sheriff of the county, who served an injunction restraining the men from the further cutting of wires. This the men at first refused to do, but after consultation with the foreman submitted to the inevitable. A mechanic's lien was taken on the building, and all property of the company, under whatever name, was attached. A cursory examination into the affairs of the company shows it to be hopelessly insolvent. The plant of the company will probably be sold at sheriff's sale.

Newton, Mass.—The Newton *Journal* says that the city will undoubtedly contract with the Newton Electric Light and Power Company for lights on the main street. It further says: "The arms used for the suspension of the lamps are entirely different from those used by any other company. The arm is stationary, serving to brace the pole and preventing the danger occasioned by the weight of the arm in counterbalancing the lamp when lowering it. The pulleys are sleet proof, and it is impossible for the snow or ice to affect them. They carry a small, flexible steel cable, which is attached to the drum used in raising or lowering the lamps, and can be adjusted at any height. The lamp is self-locking, and is securely held in place by means of a pawl, and is lowered by means of a crank. Any attempts made by outsiders in the way of lowering or raising the lights are thus checked. The advantage derived from lowering the lamp by means of the cable is very great, enabling the company to light and trim from the ground, and obviating the necessity of ladders or other means in reaching the lights. In cases where the light is needed in the centre, a cable is stretched across the street and the lamp suspended from it. Each lamp will be provided with a funnel-shaped protector, which keeps out the snow and ice and enables the lights to be used constantly, as they can thus be easily started even under the most unfavorable conditions of the weather. The engine-room is 86 × 36 feet, and contains a 70 horse-power Armington-Sims engine, a steam pump and a dynamo of the Thomson-Houston pattern. The boiler was constructed by the Jarvis Company, is of 125 horse-power, and is supplied with all modern improvements, including Ashcroft's furnace door and a rocking bar grate."

APPLICATIONS OF POWER.

Glasgow, Scotland.—The Glasgow Tramways Company desires powers from Parliament to work its road with electric motors.

Van Depoele Roads.—The Van Depoele Company has a contract for a large new electric road at Binghamton, N. Y., and is busy on the Montgomery, Ala., road. The Appleton, Wis., road is to be enlarged.

Desirable for Canada.—A correspondent of the Montreal *Witness* directs the attention of Canadian street railway men to the success of the Van Depoele road at Windsor, Can., where the cost of operation is now said to figure out two-thirds less than animal power.

Cincinnati, O.—The Mount Adams & Eden Park Street Railroad Company, operating lines on Walnut Hill, have decided to make the Oak street line an electric road, and changes to accomplish that result will be made at once. It is understood that this is for an experiment, and that, should it succeed, electricity will be used largely on street railroad lines in that city.

Bangor, Me.—Mr. H. McL. Harding, the able New England agent for the Sprague motor, has been before the Bangor city government to advocate the merits of the plan for putting an electric railway in that city. Mr. Harding not only discussed the question, but gave news of various roads and methods with the help of a sciopticon. His address created a most favorable impression. Won't Mr. Harding do some more evangelistic work of this kind?

American Institute of Electrical Engineers.—A special meeting and dinner of the American Institute of Electrical Engineers will take place at Cable's Restaurant, 130 Broadway, on Tuesday, February 8th, at 6 o'clock P. M. Mr. Schuyler S. Wheeler, of the "C. & C." Motor Company, will read a paper on "The Practical Requirements of Small Motors." The paper will be accompanied by very interesting experimental tests with apparatus specially prepared for practically demonstrating the efficiency of such motors, and will be followed by a general discussion of the various points presented.

Boston.—It is said that "Backbay" lands in Boston have advanced greatly since the new West End Company began work and announced its intention of putting in an electric railway. Mr. A. S. Porter, a leading local real estate agent says: "The advance in values in that direction had been enormous. Land on Commonwealth avenue that had sold for $2 a foot five years ago now sold for $13, and it was not speculation that did it, but a real advance in value caused by legitimate demand. An admirable feature of the West End lands was their accessibility through the projected railway line. Residents could get into a comfortable car, propelled by electricity, free from noise, smoke or dust, and be landed at the opera in 20 minutes or so. The new lands were destined to be the great desirable residence section of the immediate future." Another agent says: "The West End railway line with its rapid transit by electricity will benefit the entire district."

PERSONALS.

Mr. T. A. Edison. has recovered from his recent sickness and proceeds to his winter residence in Florida, where, with renewed health, he hopes to continue his electrical experimentation.

General C. P. Stone.—We regret to announce the death in this city of General Stone, whose name is indissolubly connected with the erection of the pedestal for the great Bartholdi Statue of Liberty on Bedloe's Island.

Mr. John D. Haines.—The death is announced of Mr. John D. Haines, well-known in telephonic and other electrical circles. Mr. Haines has of late years been prominently interested in a number of street and suburban railway enterprises. He died at Newburgh on Jan. 25, and was buried last week at Coxsackie.

Col. W. A. Roebling has, we are very glad to note, recovered his health. It was thought at one time that the strain and sickness incurred by him in assisting his father in the great work of building the Brooklyn Bridge would prove fatal, but by slow stages his strong constitution has reasserted itself, and he is now practically "a well man."

Mr. Hartley Gisborne, the well-known district superintendent of the Canadian Government telegraph lines in the Northwest, has been presented by the staff at Battleford with an address on parchment and a rich silver tobacco box. The address says: "We willingly bear testimony to the energy and ability which have always characterized your management."

Mr. Harry Vander Weyde.—There is some ability in the Vander Weyde family. A London note has this: "One of the cleverest of the minor pictures at the Suffolk street show of the British artists is a painting on the line by Harry Vander Weyde, the 16-year-old son of the celebrated Regent street photographer, who is himself perhaps the most notable illustration over here of what American energy and skill can do."

Mr. Hiram Sibley.—Cornell University is to receive another large benefaction. Prof. Thurston reports having received assurances from the Hon. Hiram Sibley, of Western Union fame, of a round quarter of a million for improving and enlarging the Sibley College of Mechanic Arts. A large building is to be constructed to the east of the present Sibley structure early in the spring, and provision made for the instruction of many hundreds of students in technical and mechanic arts.

Col. Wm. A. Stedman.—Speaking of the acceptance by this

gentleman of the position of treasurer in the American Electric Manufacturing Company, *Light, Heat and Power* says: "The importance of Col. Stedman's accession to the gas electric ranks is freely admitted even by the Rip Van Winkles who oppose, and will continue to oppose, the admission into the lighting field of any element not fully adopted, years ago, by those whose old shoes they are wearing out. Col. Stedman has been no unknown quantity in the gas interests for past years. His clear perception, honesty of motive and steadiness in purpose have long since placed him among the foremost readers in debate and counsel, and whether expressed with the care of a thoughtful writer or with the freedom of a ready speaker his opinions and suggestions have met with appreciation and consideration wherever read or listened to."

MISCELLANEOUS NOTES.

An Electrical Baton.—Sir Arthur Sullivan uses in leading the new Gilbert-Sullivan opera "Ruddygore" an electric baton of the Carpentier form, as described elsewhere in these columns.

Voltaic Electricity.—Before the Buffalo Electrical Society on Jan. 22, Mr. W. Finn delivered the third of his course of elementary lectures on the above subject. He dealt specially with Ohm's law and its applications.

New Manufacturing Companies.—The Norwich, Conn., Insulated Wire Company has been incorporated by C. W. Lanpher and others, with a capital stock of $250,000. The Tucker Electrical Manufacturing Company, of East Orange, N. J., organized by C. R. Hedden and others, has a capital stock of $100,000.

A New York Subway Decision.—Judge Van Hoesen in the Court of Common Pleas has handed down a decision denying the application of the Subway Commission through Mr. C. A. Hess, for an injunction to prevent the North American (Johnstone) Underground Company from laying conduits in this city. The decision insists that the Commission has no right to clothe the Consolidated Company with monopoly rights, and hints that it has altogether exceeded its powers. It is said that the Commission will resort to the Legislature for confirmation of its acts.

"The Great Authority."—Mr. W. J. Johnston, editor and proprietor of THE ELECTRICAL WORLD, has favored us with a copy of his pamphlet, setting forth the progress and compass of his journal, with illustrations of its various departments. Everything about this pamphlet betokens success, and we cannot resist the temptation to quote a few words from its pages on the important subject of the development of technical journalism: "At first, and not many years ago, the best scientific periodicals sought to be comprehensive, but now the range of subjects is so vast, and the exactitude of research in each is so great, that no single paper can assume to deal properly with more than its own specialized department," and in this spirit THE ELECTRICAL WORLD has become the great authority on its specialty in this country.—*N. Y. Tobacco.*

New York City.—It begins to look as though New York is to have its underground road. The United States Subway Company now controls four corporations possessing rights for underground roads, and has secured the important Vandenburgh charter. The following are the officers of the reorganized board: Edward Lauterbach, president; Col. Calvin Goddard, treasurer; L. H. Rullman, secretary; the United States Subway Company, which is to build the road, being represented by Col. Rowland R. Hazard, Richard Irvin, Jr., banker; David H. Bates, President of the Baltimore & Ohio Telegraph Company; Heeman Clark, contractor; Henry Clews, S. L. M. Barlow, J. Coleman Drayton and John H. Davis. Of the old directors, who comprise the Vandenburgh interest, Col. Origen Vandenburgh, George R. Blanchard, Henry D. Sedgwick, Nelson G. Waterbury, Samuel R. Campbell and Frank Loomis still continue in the new board, and complete the list.

Struck by Lightning.—The steamship "Salerno," has arrived at New York having the ship "Constance" in tow. The ship looked as if she had been engaged in a tremendous naval battle. All that remained of her masts were three shivered and splintered sticks. She sailed from Rotterdam Dec. 14. All went well until Jan. 10. Then she was struck by a fearful gale. At 5 o'clock A. M., there was a thunder-storm, with vivid lightning. A few minutes after 5 o'clock there was a blinding flash, followed by a crash. The lightning had struck the vessel. The few who were on deck at the time say that the foretopmast was first struck, that from there the bolt passed to the mainmast and then to the mizzenmast, and then "quietly dropped overboard by way of the chains." Whatever path it took it went through the masts most thoroughly. The mainmast was leveled to the deck and fell across the pumps, making them useless. No part of the vessel except the masts and rigging was injured. The débris was chopped away. For five days she drifted toward the east, until on Jan. 15 she was sighted by the "Salerno." There was no suffering on board, but the sailors are inclined to regard their escape as little short of miraculous.

A Sound Sleeper Aroused.—A telegraph operator tells the Buffalo *Courier* a good story of another one of his profession. The latter was doing night work, and was noted among the trainmen as an awful sleeper. If he once got asleep it was almost an impossibility to awaken him. He was a continual source of annoyance to conductors and engineers, and they resolved to do him up the first opportunity that offered. It came one night about 12 o'clock. A freight pulled slowly into the yard, but the operator was not on hand. There he was in the office with a board stretched between two chairs and snoring for all he was worth. The trainmen could hardly contain themselves for joy, and after shaking hands all round, started to get even. They gently and reverently lifted the sleeping operator, board and all, and carried him out. Up the track they went until the full glare of the headlight was reached. Here they quietly placed him with "his face toward the foe." The boys got out of the way and the engineer mounted the locomotive, opened the cylinder cocks, pulled the whistle wide open and rang the bell. The operator turned uneasily once or twice, sat up quickly enough to break in two, gave a look at the engine and struck out for the next county.

SPARKS AND FLASHES.

It "Talks Back."—Telephone agent—"I am sure that if you had one of our 'phones in your house——" Private citizen—"I don't want any telephone in my house. My wife died three weeks ago and——." Telephone agent—"I sincerely condole with you, sir. But what has your wife's death to do with your not wanting a telephone?" Private citizen—"A good deal, sir. I'm a man to profit by experience. I won't have anything in my house that talks back."—*Philadelphia Call.*

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts, cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver steel and iron wire, shafting tools, etc.

Page Belting.—The Page Belting Company, of Concord, N. H., have issued their catalogue for 1887 of leather and rubber belting, lace leather, etc., including a telegraph cipher code for ordering and some eminently practical rules as to the purchase and use of belting. The catalogue is, in fact, a manual of belting, and ought to find attentive readers among all connected with electric light stations.

Lava Insulators.—The D. M. Steward Manufacturing Company, of 231 and 233 State avenue, Cincinnati, O., find the demand brisker than ever for their excellent and well-known lava insulators. Wherever these insulators are used there is a minimum of risk of fire. The insulators are in use by all the leading electric light companies and are favorably commended in all quarters. The insulator, it may be noted, is waterproof as well as fireproof and does not warp.

THE EDISON ELECTRIC ILLUMINATING CO., of Cumberland, Md.
CUMBERLAND, Md., January 10, 1887.

Chas. A. Schieren & Co., 47 Ferry St., New York:

GENTLEMEN:—We began using your belts in December, 1885, when we purchased of you as an experiment a 10-inch two-ply Electric Belt. This belt gave such entire satisfaction that we have since purchased no other, and as our old belts (canvas) gave out, replaced with yours, until our entire six dynamos are equipped with them. Four of our dynamos have pulleys only 12 inches diameter and two 14 inches. Our belt speed is about 4,630 ft. per minute. The 10-inch belts are each doing at times 60 h. p. work, and the 9-inch 40 h. p. We find that the belts are very free from vibration and give but slight trouble from slippage.

I have no hesitancy in recommending your belt to any Electric Light Company, or any one desiring a good serviceable belt.

Yours very truly,
J. B. G. ROBERTS, Treas'r and Gen'l Manager.

STOCK QUOTATIONS.

The following list, compiled by Mr. W. H. Baker, member New York Stock Exchange, 16 and 18 Broad street, gives the current quotations of electrical stocks:

February 1, 1887.

TELEGRAPH.	Bid.	Asked.
Am. Dist.	27	35
Am. Tel. & Cable	71	74
Cen. & So. Am.	93	100
*Com. Tel		
*Gold & Stock	92	
*Inter. Ocean Tel.		
N. Y. Mutual	72	
Pac. & Atl.	47	54
*Postal T. & C.	30	35
South. & Atl.	60	70
W. U. Tel.	71¾	71⅞
W. U. Scrip	61	
W. U. Bonds		118½
Mut. U. Bonds	84	85
TELEPHONE.		
Am. Bell	211	212
Am. Speaking	110	120
Erie	27⅛	
*Hudson River	60	65

TELEPHONE.	Bid.	Asked
Mexican	1¼	1½
*N. Y. & N. J.	87½	93
N. Y. & Pa.		
New England	43¾	44
*Southern Bell	110	130
ELECTRIC LIGHT.		
*Am. Electric		
*Brush		
*Brush Ill		
*Consolidated		
*Daft		
*Edison	195	200
*Edison Ill	97½	110
*Edison Isolated		
*United States	35	
*U. S. Ill	95	100
MOTOR.		
*Daft		
*Sprague		

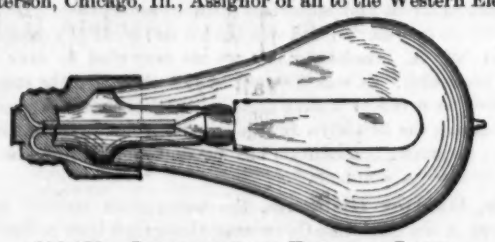
* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED JAN. 18, 1887.

(1) 356,151. Underground Conduit for Electric Conductors; (2) 356,152. Conduit System for Electric Conductors; (3) 356,153. Electric Wire or Cable Distributing System; J. F. Munsie, Chicago, Ill. Application of (1) filed July 30, 1886; (2) Sept. 17, 1886; (3) Sept. 18, 1886. (1.) Consists of novel arrangements by which the wires or cables can be distributed to the best advantage. (2.) The invention relates specially to means for hauling wires or cables through conduits. (3.) The invention consists in novel means for distributing the wires.

(1) 356,156. Insulating Telegraph Cables; (2) 356,206. Manufacture of Telegraph Cables; (3) 356,207. Method of Insulating Electric Conductors; W. R. Patterson, Chicago, Ill., Assignor of all to the Western Electric



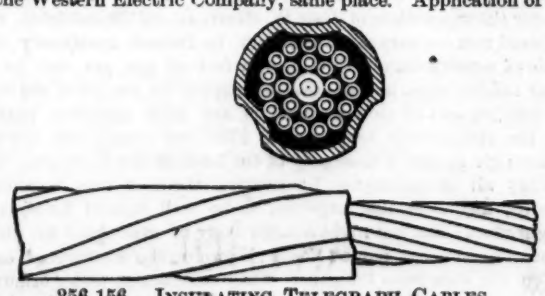
356,199. INCANDESCENT ELECTRIC LAMP.

Co., same place. Applications filed respectively, Feb. 2, July 2, Aug. 16, 1886. (1.) The invention consists in grooving the lead pipe after the filling has cooled, thereby reducing the area of the interior opening, and thus compensating for the shrinkage of the filling material. [See illustration]. (2.) The object of the invention is to test the lead pipe as it is being formed over the core, so as to discover any flaw or imperfection in the lead pipe. (3.) The invention consists in passing the wire after it has received its fibrous coating rapidly through a thin solution of glue without saturating the body of the fibre. The wire is then dried and paraffined.

356,197. Telephone Receiver; E. T. Gilliland, New York, N. Y. Application filed Aug. 2, 1886. For description see page 64 this issue.

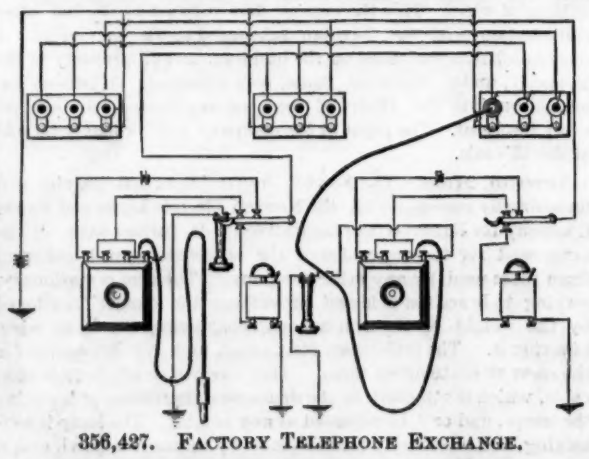
356,199. Incandescent Electric Lamp; Wm. Holzer, Harrison, N. J. Application filed March 24, 1886. The invention relates to incandescent lamps designed to be placed in series with one another. The object is to prevent the arc, which usually forms across the carbon loop when the same is broken, from proceeding down the wires into the base of the lamp and destroying the socket and cut-out mechanism. [See illustration.]

(1) 356,211. Dash Pot for Electric Arc Lights; (2) 356,425. Test Circuit for Multiple Switch-Board Systems; (3) 356,426. Multiple Switch-Board Test Circuit; (4) 356,427. Factory Telephone Exchange; C. E. Scribner, Chicago, Ill., Assignor of all to the Western Electric Company, same place. Application of (1)



356,156. INSULATING TELEGRAPH CABLES.

filed June 1, 1886; of (2), (3) and (4) Nov. 6, 1886. (1.) It consists in connecting the piston of the dash-pot with the lifting lever of the arc lamp in such a manner that the lever may move a short distance unretarded by the sluggish action of the dash-

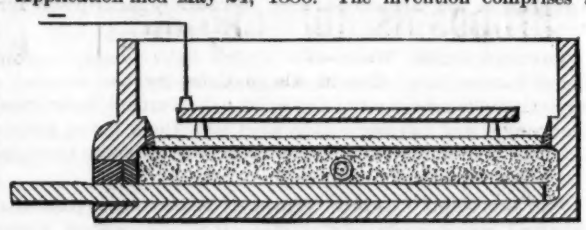


356,427. FACTORY TELEPHONE EXCHANGE.

pot. (2.) The object of the invention is to provide a connection which automatically closes the test wire of the calling subscriber's line to ground when the line is put into use. (3.) The object of the invention is to provide circuits and switching apparatus whereby the test wires of any two lines are connected together when the plug of one line is inserted in the spring jack of the other line. (4.) This is a system of telephone circuits specially designed for use in factories or stores in which the stations are limited in number and not far apart.

356,261. Primary Voltaic Battery; J. E. Pearce, Maidenhead, County of Berks, England. Application filed August 19, 1886. This is a gas battery and the first claim describes it as follows: A primary voltaic battery consisting of a vessel or jar, horizontal slabs of porous carbon and metal constituting the electrodes, a packing of granular carbon, a liquid solution of a compound of the metal electrode, and free chlorine gas circulating through the granular carbon during the entire working of the battery. [See illustration.]

356,282. Electric Lamp; August Harding, Oakland, Cal. Application filed May 24, 1886. The invention comprises a



356,261. PRIMARY VOLTAIC BATTERY.

motor for regulating the feed of the carbons, and its particular object is to give an unlimited reciprocating motion to the carbon holder, while the armatures of the controlling magnets have but a small and limited motion.

356,300. Telephone System; A. M. A. Beale, New York, N. Y. Application filed Oct. 31, 1885. The invention consists in transmitting speech by varying the electro-static condition of the line. It is an improvement on another invention by the same inventor.

356,390. Electric Accumulator; C. B. de Montaud, Paris, France. Application filed Oct. 23, 1886. For description see page 64, this issue.

356,418. Electrical Call-Box; G. S. Nickum, Dayton, O., Assignor of one-half to E. F. Stoddard, same place. Application filed Feb. 25, 1886. This is an improvement in district messenger signal boxes, whereby the sending in of false signals by mistake is guarded against.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.